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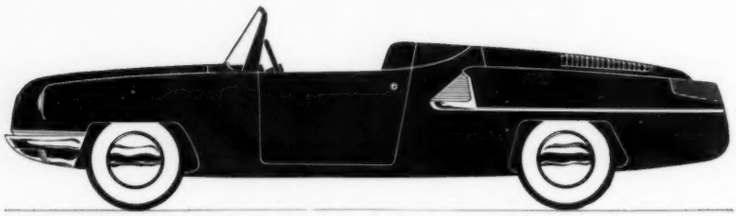

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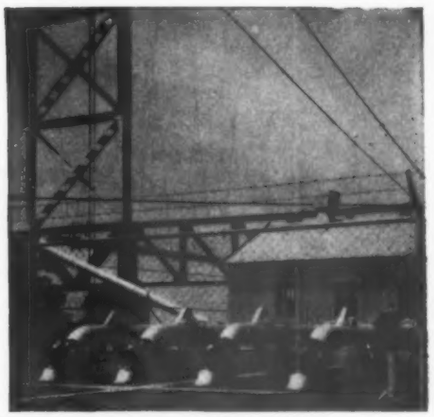

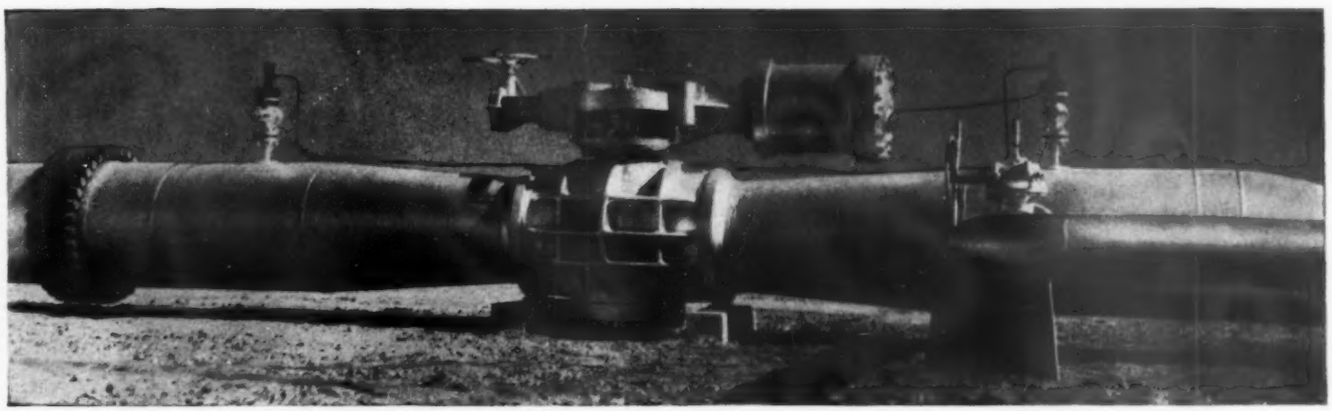

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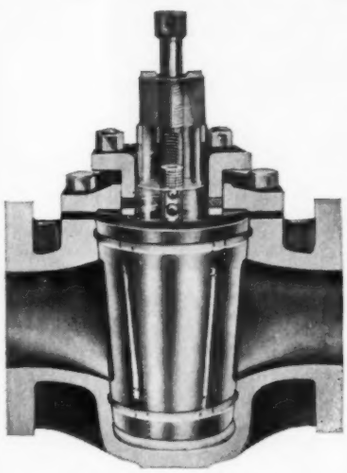

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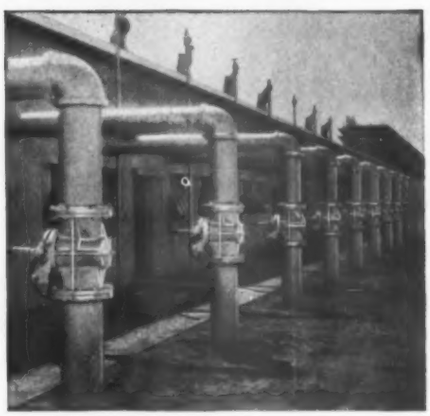

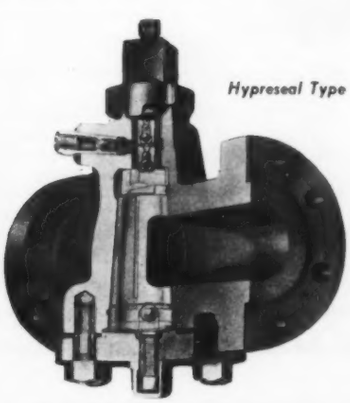

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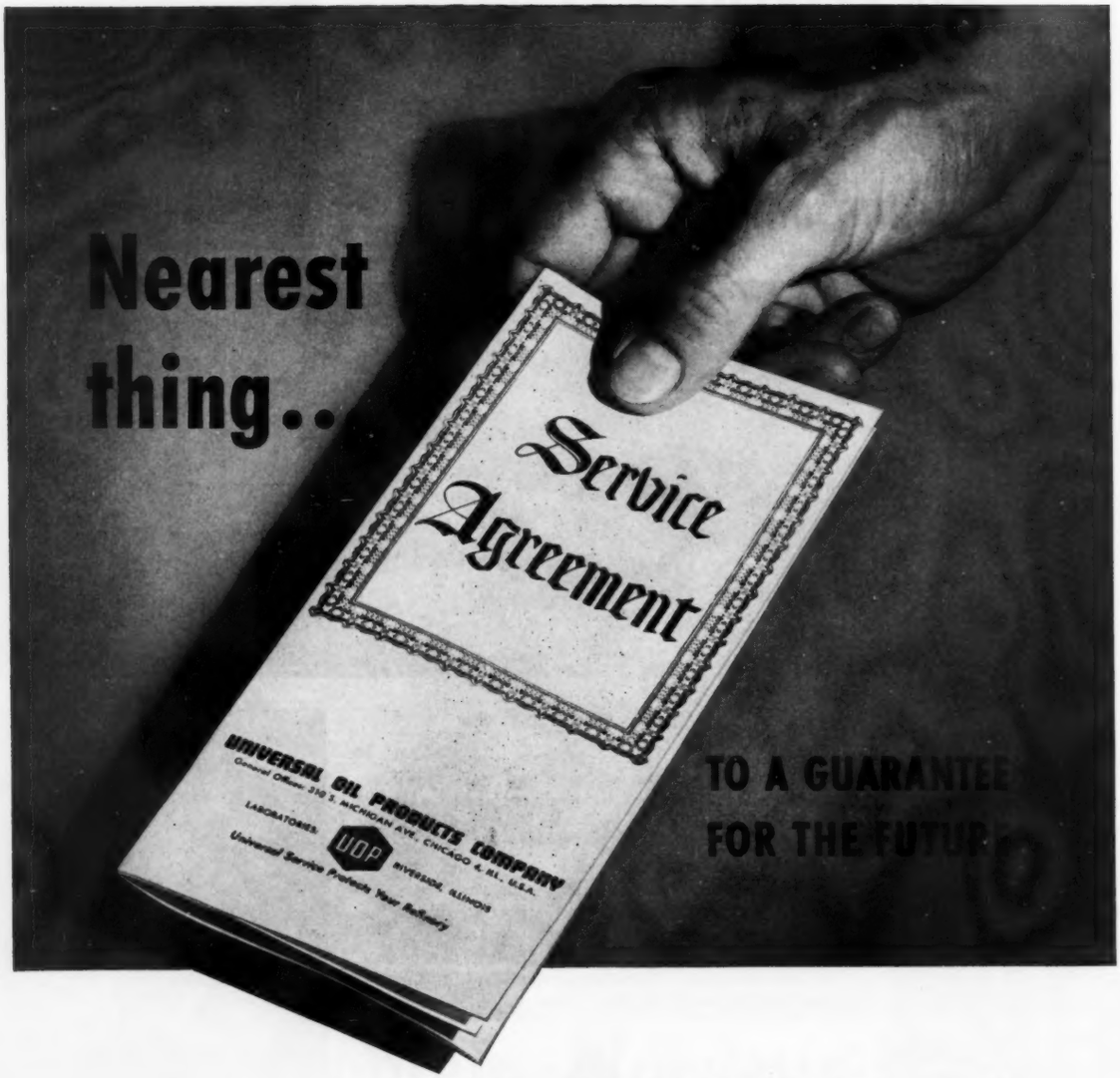

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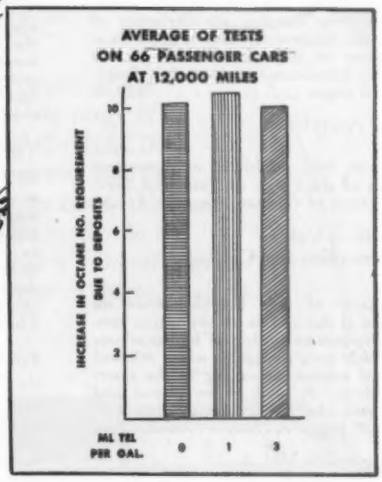

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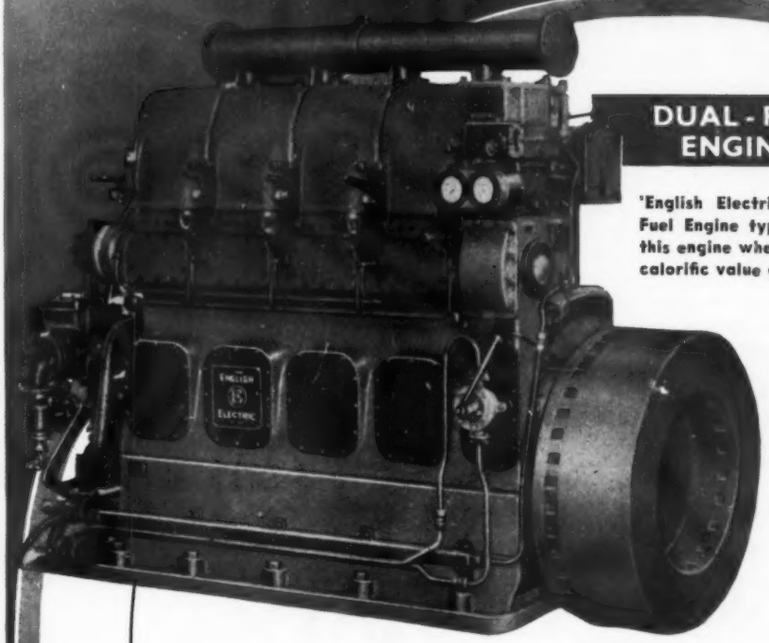

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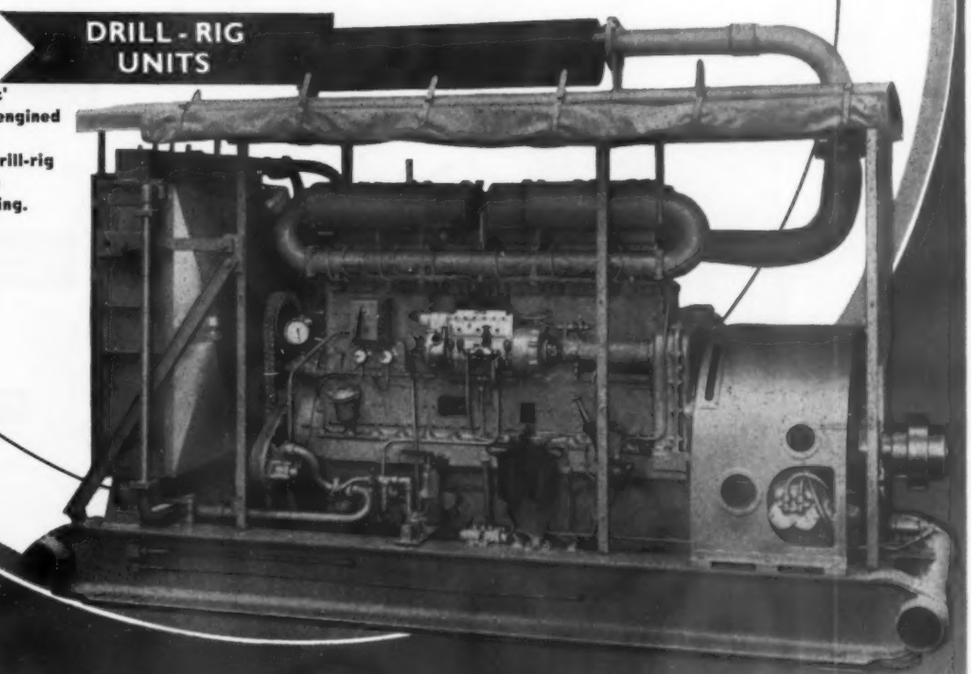

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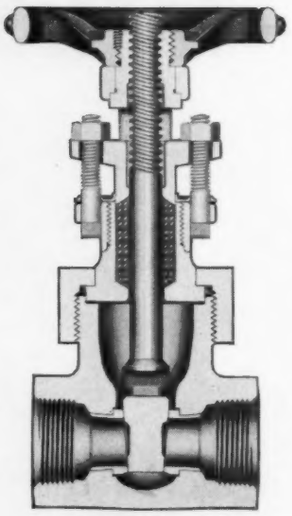

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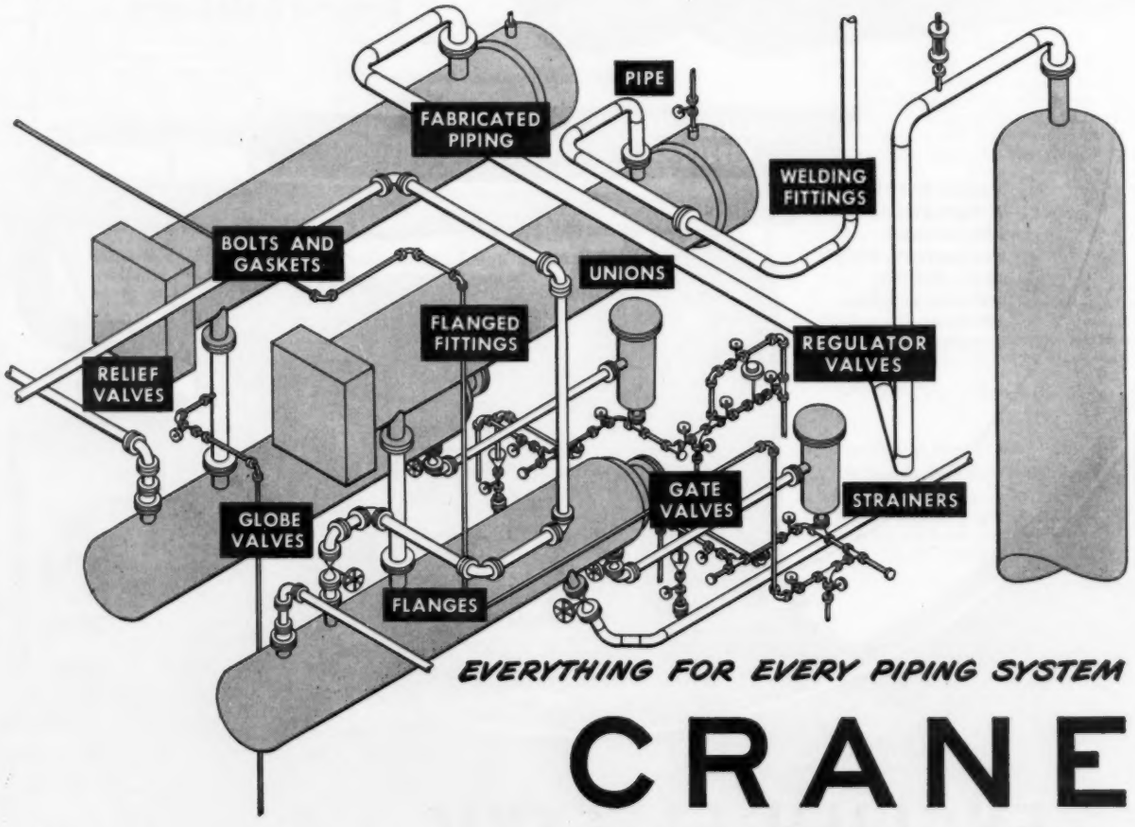

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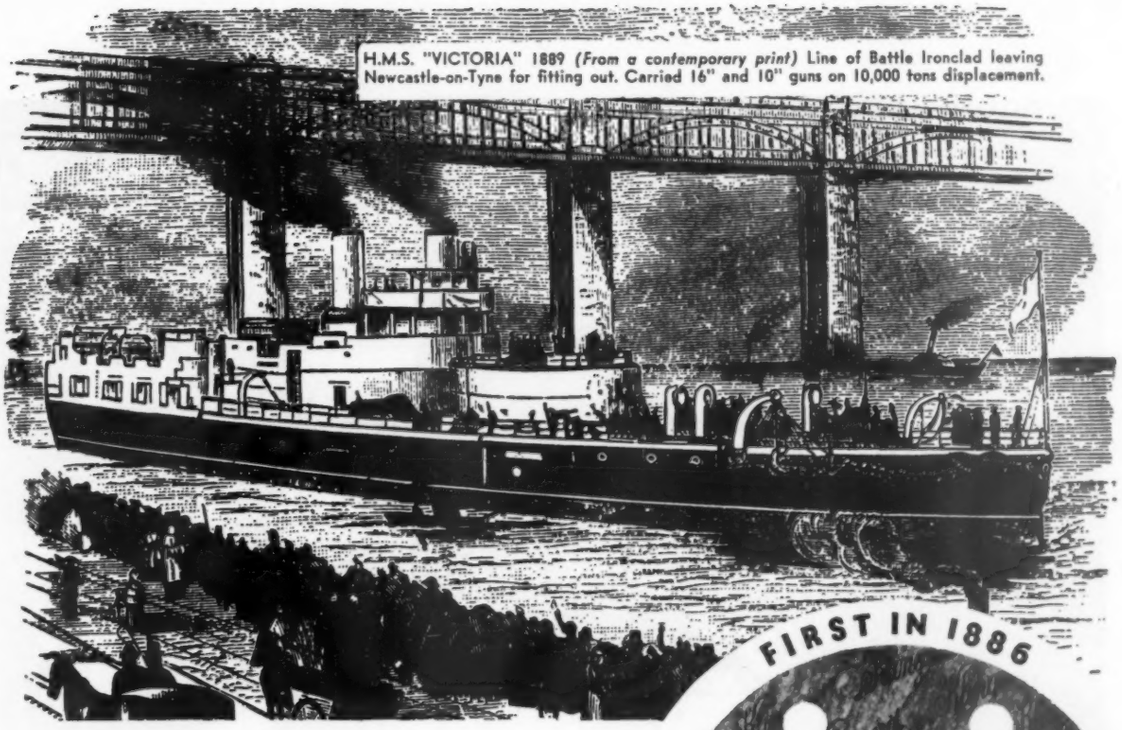

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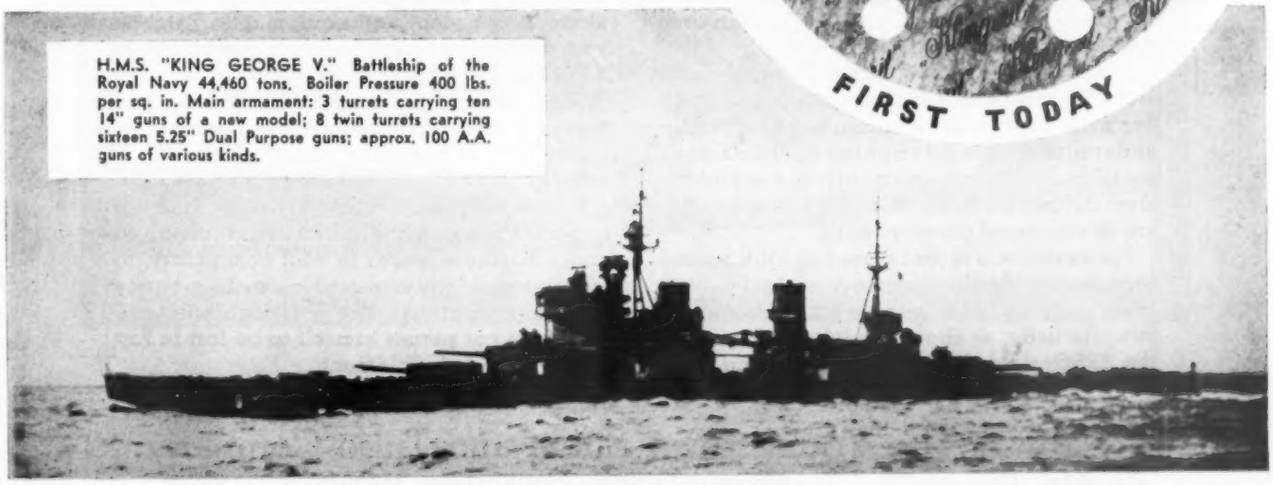

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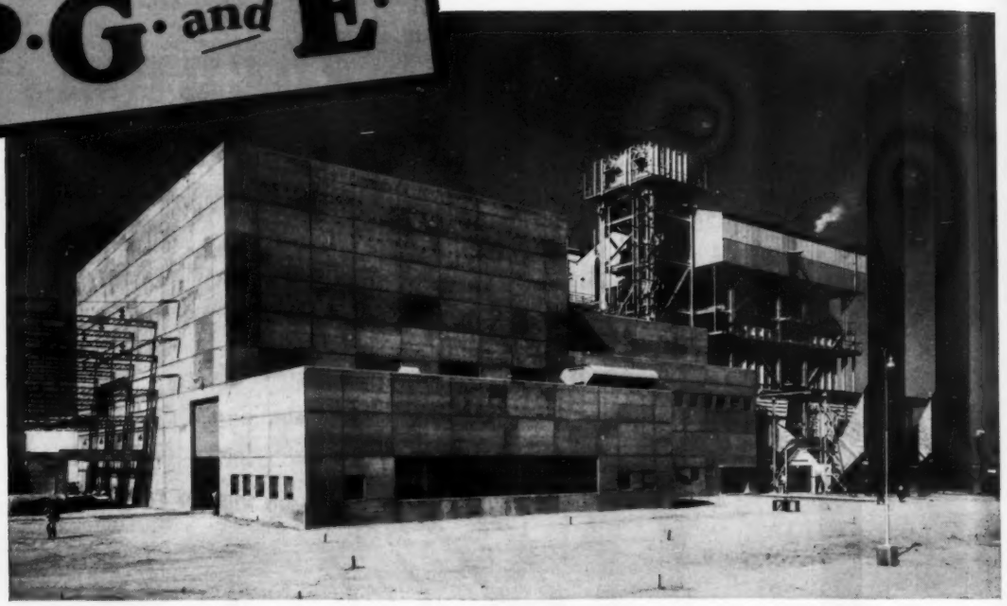

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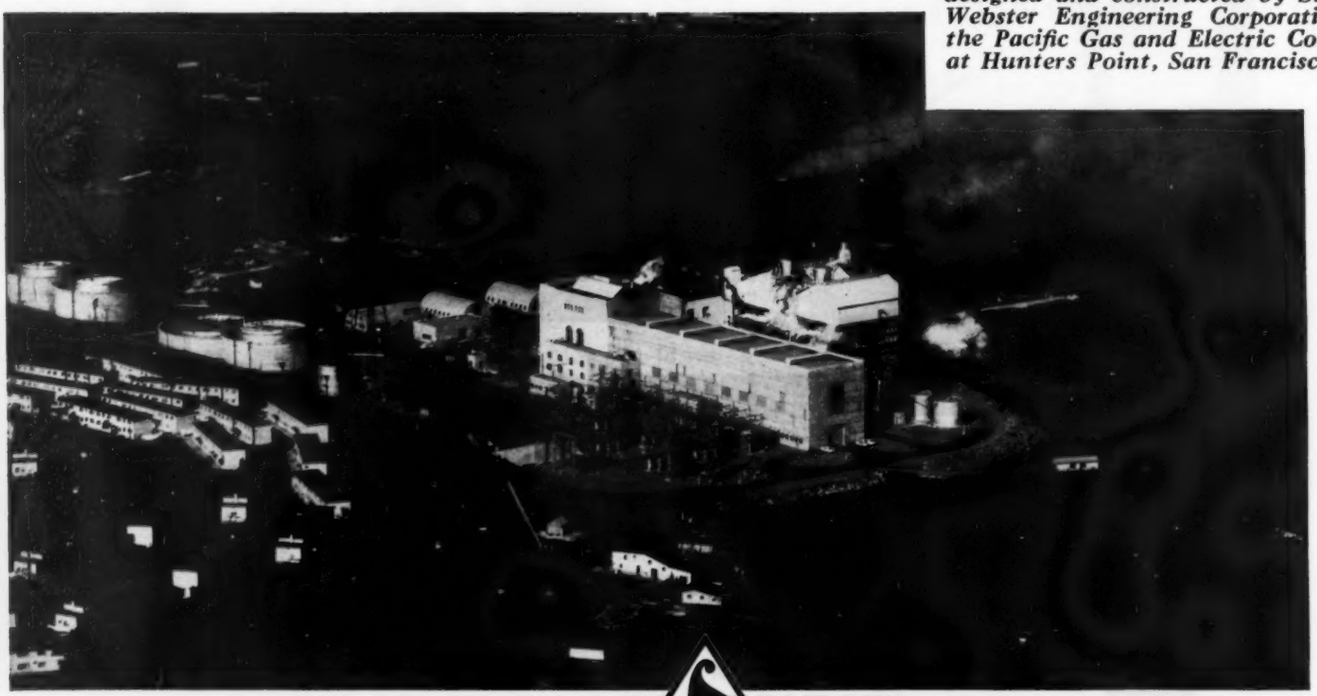

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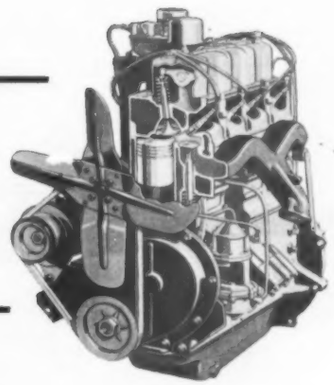

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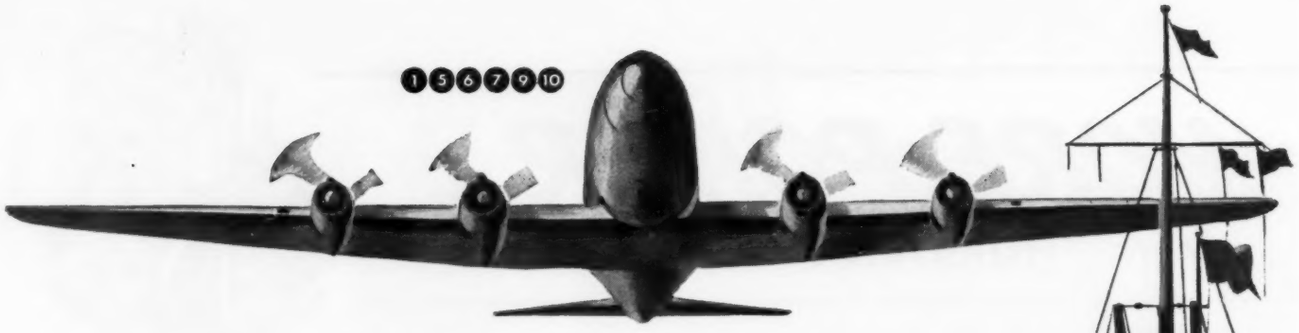

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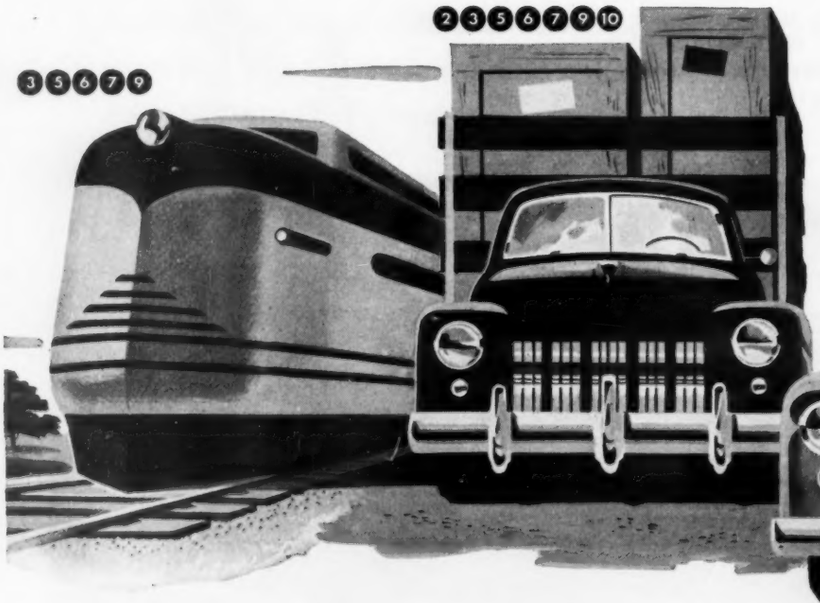

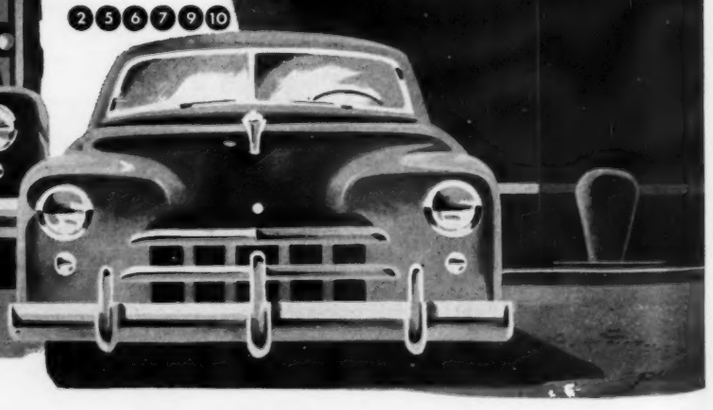

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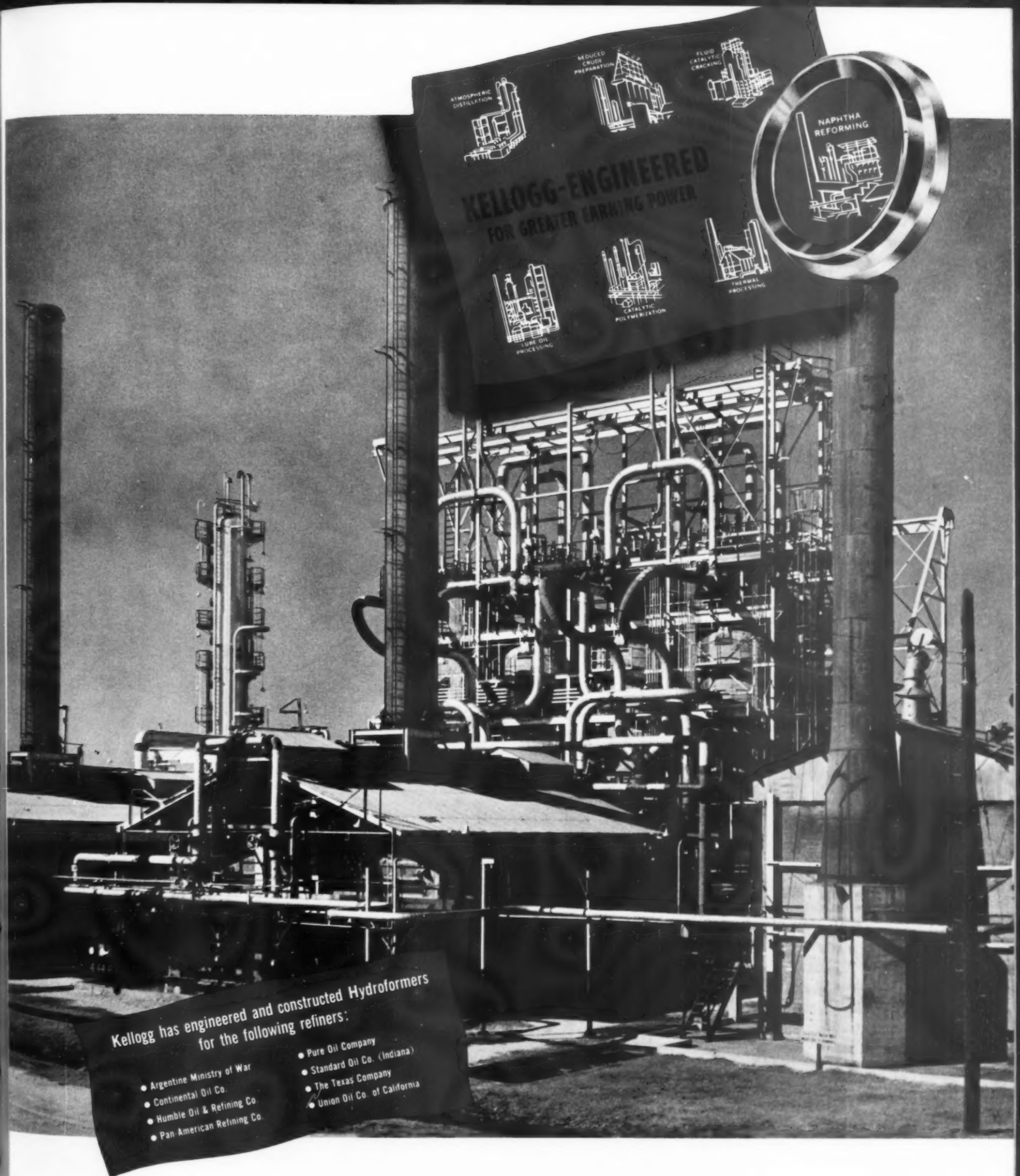

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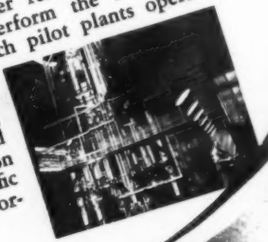

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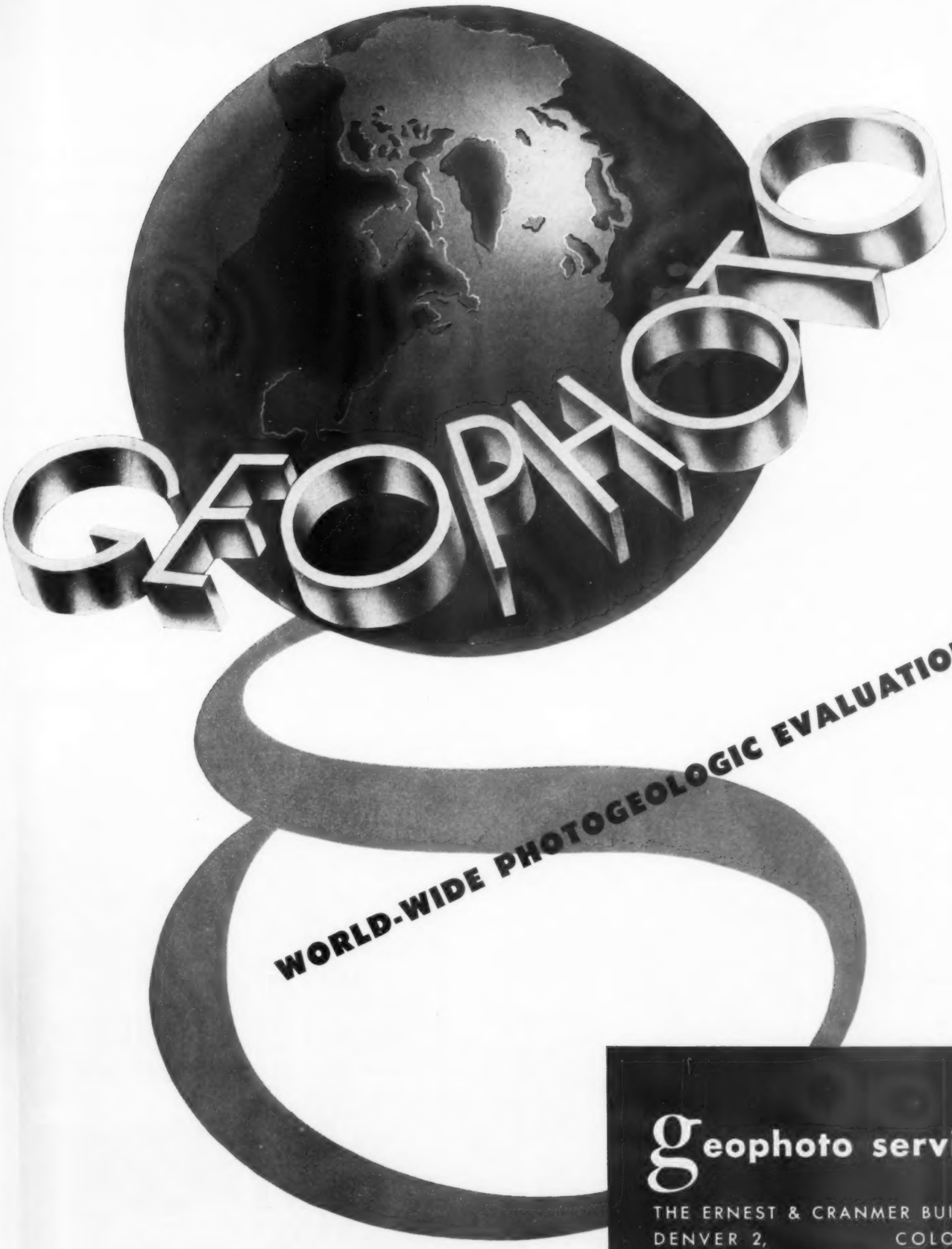

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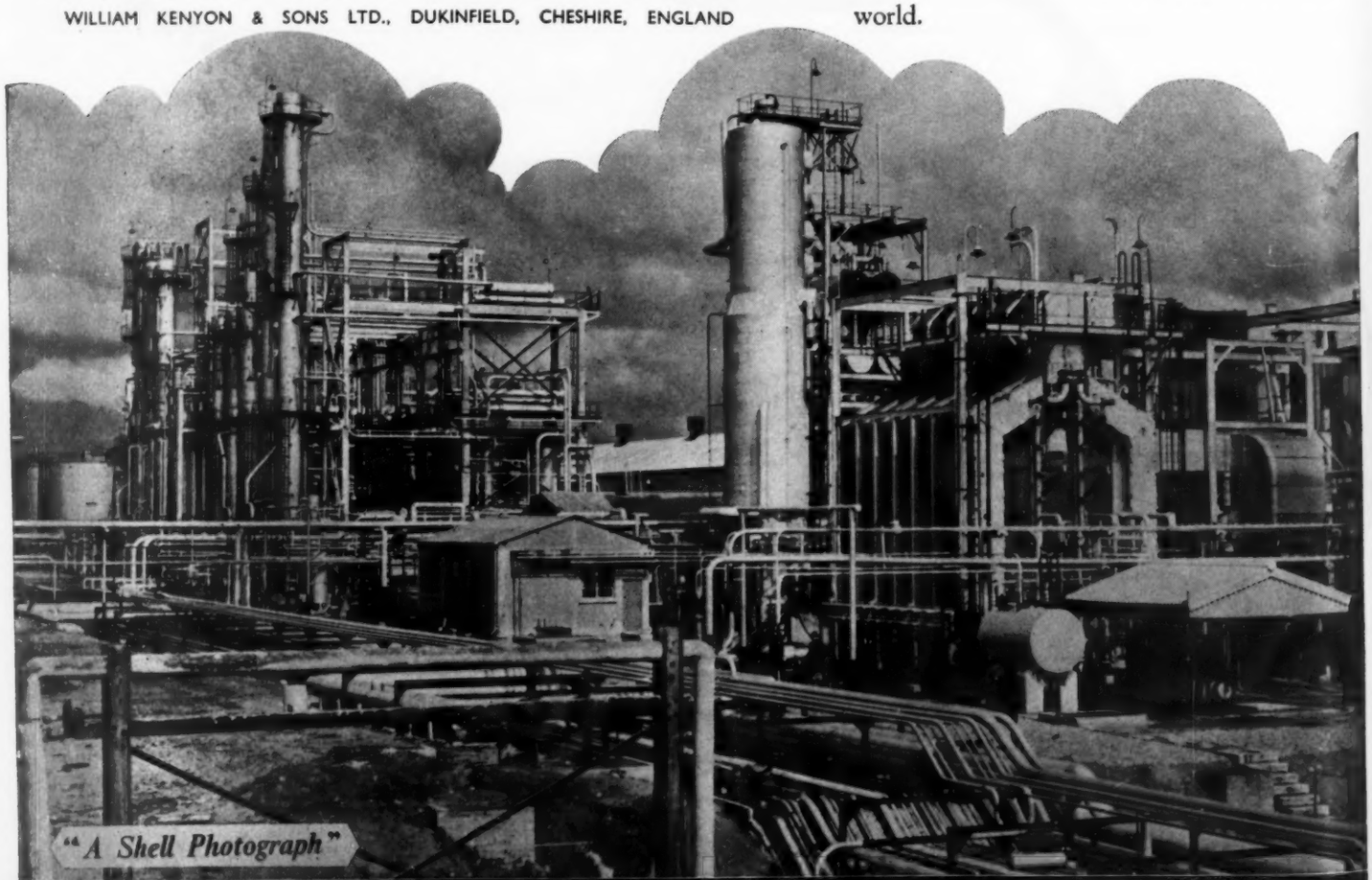

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THIS MONTH'S COVER

Rotary filter in the $42 million lubricating oil plant built by Cit-Con Oil Corp. at Lake Charles, La. Filter is installed in the methyl ethyl ketone dewaxing unit. Cit-Con is jointly owned by Cities Service Co. and Continental Oil Co. Photograph is by Fritz Henle.

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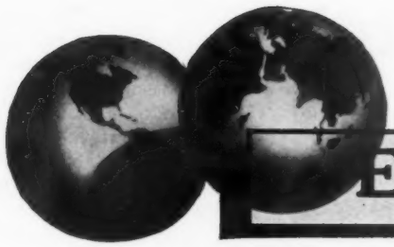


Editorial

Oil Moves to New High Level of Activity

FOR months past the statistics of current activity in the oil industry have been telling a story of steady improvement. The gain has been visible in all branches of the many-sided business—in declining stocks along with rising production and strengthening prices, a combination that gives unimpeachable testimony to expanding consumption. It is not a local condition but is evident in all markets and in all branches of the oil trade. And it has been long enough sustained to prove that it marks a definite rise of petroleum products to a higher and lasting level of demand.

Like most other industries, oil has its ups and downs, the pendulum swinging between poles of shortage and plethora. Looking back over its history, one notes that the dips sometimes have been sudden and severe but that the new plateau at which stability is established following a temporary setback is always broader and higher than the one from which it dropped.

Resumption of the rising curve in petroleum demand following the downtrend of 1949 began to make itself definitely felt by the end of the first quarter of 1950 and has continued steadily since that time. That it is soundly based is indicated by the evidence of its effect upon all branches of the industry. In the United States where statistics are more promptly available than in some other parts of the world, many figures being published on a week-to-week basis, the uptrend is clearly traceable, but the same movement is observable in other areas.

Domestic crude output in the United States rose steadily for ten straight weeks ending July 8, the latest date for which figures had been issued at this writing. The daily average for the first week of July was 5,476,000 barrels, an increase of three quarters of a million barrels daily, or roundly 12 percent over the corresponding week of 1949. In the same week refinery runs set an all-time record of 5,912,000 barrels daily, including 499,000 barrels of imported crude, exceeding the figure of 5,880,000 reached at the end of 1948 and over 700,000 per day above the same week in 1949. That demand has risen more rapidly than production is shown by the drop in crude stocks from 275 million barrels in mid-season of 1949 to 240 million at the end of June 1950.

Among manufactured products motor gasoline enjoyed a substantial increase during 1949 which has continued this year with a seven percent rise during the first half. Distillate demand is up nine percent over last year, and stocks which were a cause of concern early in the year have been reduced by ten million barrels from midyear 1949. An indication of the further outlook for domestic heating oil is the Oil Heat Institute's estimate of 850,000 new central heating installations and a million space heaters during the current year.

A noteworthy change is that which has taken place in residual fuel oil. Its situation was regarded as particularly troublesome a year ago. Improvement in demand began even before the end of the year, and during the past six months its consumption has been 15 percent higher than in the first half of 1949. As a result stocks at midyear had been reduced a full 60 percent to a little over 40 million barrels. The rising tempo of industrial activity has stimulated the use of residual fuel, and increased maritime activity has led to a recent rise in the price of Bunker C for ships' use.

Responding to the growth in the number of automobiles in service, the use of lubricating oils by motorists has risen consistently, but a still more rapid gain has resulted from the high pace of industrial activity. With higher sales both in domestic and export trade, prices have risen and stocks have declined.

Reasons for the rapid and general acceleration of oil industry activity, which has caused Secretary of the Interior Chapman to point out that the American people are now using oil at a higher rate than at the peak of World War II, are not far to seek. The Federal Reserve Bank index shows that industrial activity has risen steadily since the end of the first quarter of 1950; employment and national income are both at top levels. The rapid pace of recovery in outside countries is raising consumption in like measure in these areas.

Stepped up demand for oil products has been reflected not only in expanding production and sales but also in those operations on which the maintenance of rising activity depends—drilling and exploration. The number of wells drilled in the first half of the year is 19,680, about 900 more than in the same period of 1949, while the number of wildcat wells at 3,600 is also ahead of the 1949 record. The number of rigs in service at the end of June was over 2,300, and the number of geophysical crews under contract and of applications for drilling permits shows a sharp increase. Similarly the demand for both field and processing equipment, which always reflects the trend in industry activity, is far ahead of the corresponding period of 1949, with a notable improvement in orders for export.

The signal rise in oil industry activities disclosed in the statistics that have been quoted took place before armed disturbance began in Korea. How great may be the influence of the Korean outbreak on the oil industry cannot be accurately foreseen. Even if the military operations are confined to their present locale, the conflict is likely to be protracted and certainly will call for large quantities of aviation gasoline and fuel oil, for materials like alkylate, butadiene, toluene and isopentane, useful in the production of synthetic rubber, explosives and other military requirements. Whatever may be the demands arising from this source, the industry is prepared to meet them. There is a substantial reserve of potential production both in United States fields and in others that can be drawn upon. The oil industry does not need the stimulus of war to provide it with a full measure of activity, but it is prepared as in the past to do its full share in war as well as in peace.

Oil Industry Equipped To Meet Present War Needs

Washington

FROM a petroleum standpoint the United States is better prepared for an all-out war today than it has been at any time in the past five years.

There is a cushion of unused producing capacity of about one million barrels daily, about the same backlog as was available in 1941. There is some excess refining capacity though of less size, but the refineries are better equipped to turn out high octane aviation gasoline. There are extra tankers in the Maritime Commission's mothball fleet and elsewhere, while more are building. The natural gas and oil pipeline construction programs of the past five years have added substantially to transportation capacity.

At the same time the outbreak of the Korean fighting underlined more than ever the importance of petroleum to the national economy and the national defense. It has been said that if food is the most important element in fighting a war, petroleum is second. And war, it is certain, would call for all the petroleum we can get. Military authorities assessing the situation estimate that at the peak of a war the United States might be using up to eight million barrels daily.

As a result, barring a sudden change in the overall, worldwide war situation which appears quite improbable, all government efforts to restrict imports of crude oil and products to the United States will be dropped. In fact from now on, petroleum companies may be encouraged to produce more oil abroad, for both consumption and stockpiling, while saving reserves within the United States. Particularly is this true of the Middle East, where access to supply might be doubtful in the event of widespread hostilities.

During the past five years the American petroleum industry has seen tight days. Following the close of World War II, demand for crude oil and products mounted faster than anyone had expected. As a result the industry was forced to intensify its operations both at home and abroad. But as that expansion got into stride, a cushion of reserve capacity in all phases of the industry was built up, until now it is at the highest point it has been since the last war came to an end.

The drive for added supplies to meet mounting requirements brought increased imports to the United States, until they were about double the 1945 level. As demand slackened in 1949, American oil and coal producers complained about the influx and urged that some check be placed upon it. Almost overnight, however, the situation has changed, and no immediate action to restrict imports is likely, at least until the present situation clears.

Even if the government encourages American oil companies abroad to increase their operations, it may not mean higher levels of imports to the United States. American producers are well aware that much foreign production can be absorbed by increased military demands for petroleum which are expected as a result of the Far East conflict and its implications.

The oil industry faces the future with confidence. Frank M. Porter, president of the American Petroleum Institute, said in a statement following the outbreak of the Korean fighting:

"The petroleum industry is fully prepared to meet any and all foreseeable military emergencies with which this nation may be confronted. . . . Since termination of hostilities in 1945, American interests have developed tremendous new reserves in Canada, South America and the Middle East which are also available for our uses to the extent of our ability to give military protection to these sources of supply. It is indeed a comforting assurance to the people of the United States to know that our domestic fields have been developed and are ready at an instant's notice to supply all foreseeable estimated petroleum requirements to meet our military demands and essential civilian uses."

In a similar vein Walter S. Hallanan, chairman of the National Petroleum Council, which serves the government in an advisory capacity, expressed optimism:

"The petroleum industry is ready to contribute its full share in meeting any emergency which may come to America's door," he said in a recent letter to Interior Secretary Oscar Chapman. "It has the reserves, the productive facilities, the trained personnel and the technological 'know-how' to produce and deliver the most vital essential of national security, just as it did in two previous wars.

"More than that, the industry has a detailed plan under which it can turn overnight all of its facilities to the national defense. The development of this farseeing program has been due very largely to the cooperative effort between the industry and the government, as carried on by the National Petroleum Council and the Oil and Gas Division of the Department of the Interior with the full cooperation of the Department of Defense.

"I feel certain that, granted the conditions of a free economy and continued recognition of the economic laws which direct its operation, together with continued government-industry cooperation, the petroleum industry can and will meet its responsibilities at home and abroad and contribute its full share in meeting the threat to world peace."

By "detailed plan" for the oil industry to go on a war footing, Mr. Hallanan refers to still-secret mobilization plans worked out by a special committee under the chairmanship of Bruce Brown in cooperation with government officials. Under this program some 200 oil men who have served in past years on the Council and the Military Petroleum Advisory Board would be called to Washington to form the nucleus of a new Petroleum Administration for War. Rationing of gasoline and heating oil products, allocations of petroleum and products where needed, targets and guides to production by each refinery, which in general outline already are in the hands of refiners and have been for some time, would be revised and sent out. The movement of tankers, shipment of products, allowables of crude production and the like would be directed from this agency.

It is not anticipated that this plan will be put into operation in its entirety in the immediate future, since such supplies as may be needed quickly will be promptly available. But the program is there for implementation, should the Korea conflagration spread widely.

Some government authorities warn that there might be difficulty in getting all the petroleum needed in the event of a general war. Some military men, while admitting that there is a surplus American producing capacity of one million barrels daily, say that this is but 15 percent of demand; one million barrels daily surplus in 1941, which then existed, was then 25 percent. It is in view of this possibility that the comprehensive plan of action has been drawn up. If it had to be put into effect, regulation of civilian use would be involved.

According to Rear Admiral Burton B. Biggs, executive secretary of the Munitions Board Petroleum Committee, the crude that could be provided from the United States alone would be "seriously inadequate" in the event of a major war. He believes:

"Considerations of national security, whether of an economic, political or military nature, should clearly recognize the essentiality of western hemisphere oil in the event of war. Under the correct concepts of the problem, should there be a war in the near future, and with the present estimates, all the oil production of the western hemisphere would be required to meet the requirements of the United States military forces and essential civilian demand of the hemisphere, with some allowance for the allies. There would be none to spare; and the rationing, at best, would need to be extremely close."

This is the darkest side of the picture. The hope and indeed the general expectation in Washington is that it will not have to be faced, but, of course, it has to be considered by those responsible for preparedness.

As a rubber supply safety-measure, the United States, which owns a $700 million synthetic rubber producing establishment, has decided to open three more plants with a capacity of 88,000 tons annually. The plants are a 75,000 ton GR-S plant at Port Neches, Texas, to be operated for the government by the United States Rubber Company; a butadiene plant at Houston, Texas, to be operated by Sinclair Rubber, Inc., a subsidiary of the

(Please turn to page 66)

A Socony-Vacuum geologist watches while a tire is replaced on the road to Abu Dhurba on the Sinai peninsula. Sudanese mounted police on camels come to investigate traffic block.

Egypt's Oil Industry Faces Uncertain Future

By RODGER L. SIMONS

Cairo

IN 1949 Egypt produced about 16 million barrels of crude oil. This production came from the Ras Gharib and Hurghada oil fields situated on the west side of the Gulf of Suez, and from the Sudr and Assal oil fields on the Sinai side of that gulf. The Ras Gharib and Hurghada fields are owned by the Anglo-Egyptian Oilfields Ltd., while the Sudr and Assal fields are owned jointly by the Anglo-Egyptian interests and Socony-Vacuum.

New production is possible on the Sinai Peninsula from areas being tested by Anglo-Egyptian Oilfields Ltd. and Socony-Vacuum; from areas tested by the Standard Oil Co. of Egypt before its withdrawal; and from open areas adjoining the present producing fields. The successful development of those areas might place Egypt among the petroleum exporting countries, but the attitude of the government toward the industry and the difficulty in obtaining confirmation of concessions after successful exploration, are deterrents to heavy investment.

Whether or not the hoped-for developments are likely to eventuate or would be of long duration is a disputed point. In a recent address before the Mining and Petroleum Association of Egypt, J. Carr, chief geologist of Anglo-Egyptian Oilfields Ltd., said, "It is likely that new oil reserves in Egypt will prove exceedingly difficult to find." Expanding this line of thought, Mr. Carr pointed out that with only six Egyptian wells successful out of 128 explored, "it would appear that the average odds against drilling a successful wildcat well are 20 to one."

Such testimony as that cited, plus the observations of others who are active in the industry here, supports the opinion that though Egypt is rich in antiquities, in that antiquity which is much older than the Pyramids of Giza—oil—she is less strong. Her oil output bears a scant comparison with that of other nations in the Arab group—Iraq, Iran, Kuwait and Saudi Arabia.

The Gemsa field, which was producing 87,000 tons a year in 1914, was down to a mere 268 tons a year when it was exhausted in 1928. The Hurghada operations, which started in 1913 and from which 35 million barrels of oil have been taken, are now down to only 800 barrels a day, and the field is said to be "approaching the end of its life." Another member of the same family, the Ras Gharib field, which has yielded 12 million tons since it was first opened in 1937, was down to 22,000 barrels a day last year and to 20,000 barrels a day this year.

The field at Ras Matarma, which was discovered in 1948, has not been drilled up completely, and further developments there are in abeyance pending the granting of a lease by the government, which has been held up for 18 months. Assal and Sudr on the Sinai Peninsula are both pretty well drilled up. Both are of about the same size and each has a proved reserve of 19 million barrels and a prospective recovery of 16 million barrels.

The fields of Assal and Sudr together have a present average annual output of just over a million tons. When this amount is added to the 1.2 million tons taken from Ras Gharib, it puts the total annual Egyptian oil output at about 2.25 million tons a year. It is affirmed that at this rate of withdrawal, Egypt will very likely be oil-less in seven years and that, unless hoped-for fields exceed expectations, there will not be enough oil left by 1958 to keep existing refineries operating.

The Egyptian government's own experience in oil operations dates from early 1921, when a small refinery was erected with a capacity of 20 to 25 thousand tons, for crude distillation and very little asphalt. This was followed in 1934 by a dual-purpose bitumen plant of about the same annual capacity, while in 1936 a larger plant was erected for crude oil distillation, with a capacity of 80 to 90 thousand tons per year.

In 1948 two units were added, one for crude distillation with a capacity of 260 to 270 thousand tons annually, and an asphalt plant of a capacity of 70 to 80 thousand tons annually.

The dual-purpose plant has been restricted to work only on crude distillation, with its capacity increased to 50-60 thousand tons a year, its pipelines being increased in diameter to achieve this throughput. The refining operations have a total capacity of crude oil distillation varying from 435 to 475 thousand tons annually. The refinery usually operates on the eleven-month year.

The Egyptian government is contemplating further extension of its refining operations by putting up two new units, one for crude oil distillation at 90,000 tons monthly and the other for cracking and reforming at 12,000 tons per month.

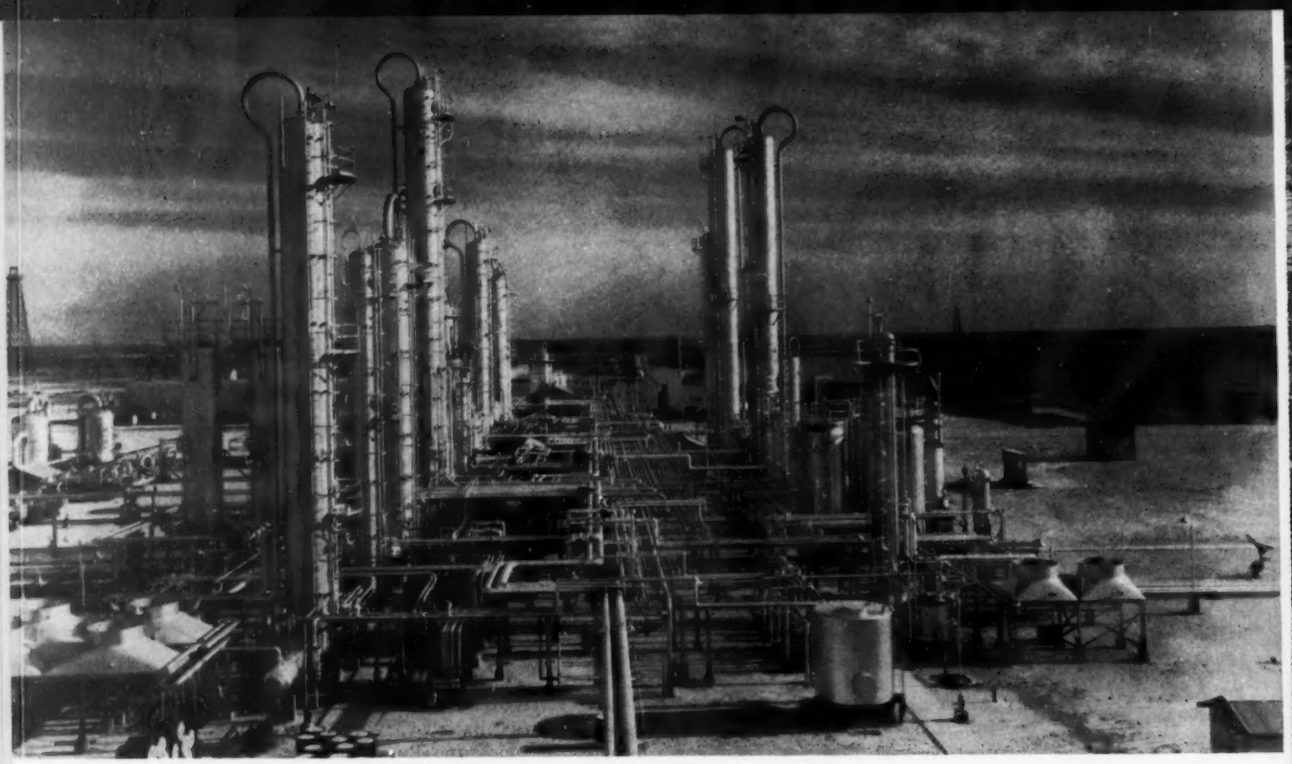
The units, except for the first two, have been erected by American firms. The 1948 equipment and the two new plants now in the works all have been under contract to The Lummus Co.

The petroleum production of Egypt is at present less than the local consumption of the country, including ships' bunkers. For this reason the imports of petroleum products during 1950 are estimated to be about 11 million barrels, valued cif Egyptian ports at about $37 million.

It has been prophesied by Torcom Papazian, managing director of the National Petroleum Co. of Egypt, that this necessity for imports will be reversed in about four years. This company, all-Egyptian in ownership, has been given a grant of 267 acres of land on both sides of the Gulf of Suez, in the same general vicinity as the present oil fields, and it has been hoped that drilling would start by mid-1950.

While awaiting developments of her domestic production, Egypt hopes, like every other country, to hold down her purchases of dollar oil in favor of sterling. For the present the quantities required monthly which are drawn from sterling sources aggregate 515,000 barrels, divided as follows in barrels: crude oil, 70,000; gasoline, 25,000; kerosene, 250,000; gas oil-diesel, 150,000; and lube oils, 20,000.

Egyptian aspirations someday to become an oil exporter appear from present indications to have small chances of realization. This is not only because of the gap to be filled before domestic requirements can be met, but also because of the relatively short life of fields thus far developed and because of the low grade of its crude (21-22 degrees API), which would make it difficult to meet the competition of other exporting countries.



Process area of the South Fullerton gasoline plant of Stanolind Oil & Gas Co. and 14 other companies and individuals which was completed in January. Processing 38 million cubic feet of gas daily the plant produces 180,000 gallons of LPG and natural. Stanolind Photo.

Natural Gasoline Approaches Stability

The Natural Gasoline Industry Has Built Many New Plants Since the War, but in Recent Months the Market Has Absorbed Motor Fuel Components Readily. LPGas Still Is in Surplus Supply.

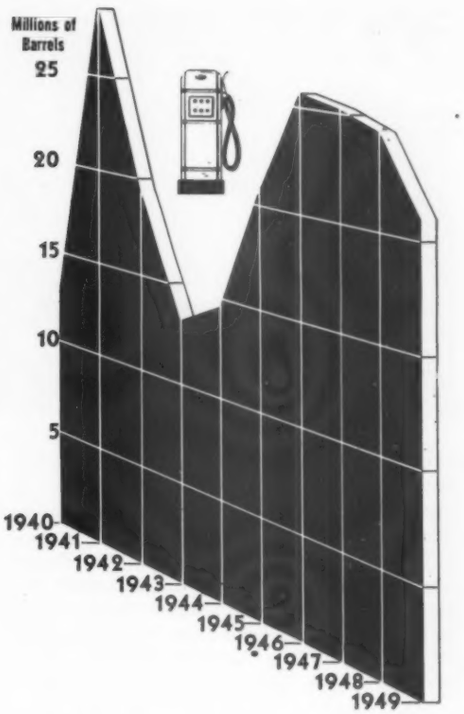
SIX months ago, producers and marketers of natural gasoline, particularly in the southwest, were in an unhappy frame of mind. Export orders aggregating 200,000 barrels monthly had been cancelled by foreign buyers who felt that they could not spend dollars for volatility in view of the currency devaluation. At the same time that the export business disappeared, production of natural gasoline and cycle plant products was increasing at a rapid pace as new postwar plants in Texas and Oklahoma were going on stream. January 1950 production of natural gasoline was 17.5 percent greater than January 1949. Domestic demand for motor fuel was only five percent higher than in the previous January. As a consequence stocks of natural gasoline rose more than a half million barrels in one month, and prices reacted sharply.

Rapid changes in natural gasoline markets are, of course, no novelty to the industry. Storage facilities for the more volatile products have never been great enough to provide an adequate cushion for any violent change in market demand. At the end of February, for example, producers were in distress, although stocks of natural at eight million barrels were only about a million barrels higher than the industry had been carrying for a year or more and represented only 16 days' production.

Sales forces responsible for moving the growing production of natural and for replacing the lost export business spent an exceedingly busy winter and early spring knocking on the doors of refinery prospects. The hard work plus sincerity in explaining the acute situation to responsible oil executives, did bring in the needed business. Three of the country's large refiners which have not been natural buyers in recent years changed their policy and began using the product. Others increased their purchases. Of great importance also was the sale of finished products direct to the jobbing trade by gasoline manufacturers and cycling plant operators. This type of movement increased 55.5 percent in the first four months of 1950 as compared with the same months a year before.

A good case can be made for the proposition that refusal of some refining departments to use a reasonable volume of natural gasoline results, in the final analysis, in a lower net return to the refining department itself as well as to the company as a whole. As shown above, when a surplus exists in the market, there is a marked increase in the manufacture of finished motor fuel by natural gasoline manufacturers and cycle plant operators. The gasoline is sold direct to the independent jobbing trade and at prices below the level of house brand gasoline, even when specifications are as good or better than

Humble Oil & Refining Co. cycling plant at Katy, Texas, has been under constant expansion to meet light hydrocarbon requirements of Gulf Coast chemical plants. It now produces 585,000 gallons of product daily. Elwood Payne photo.



In periods of oversupply increasing quantities of natural gasoline are finished as motor fuel and sold direct to the jobbing trade. Chart shows volume sold direct in recent years. See chart below for percent natural blended with refinery gasoline.

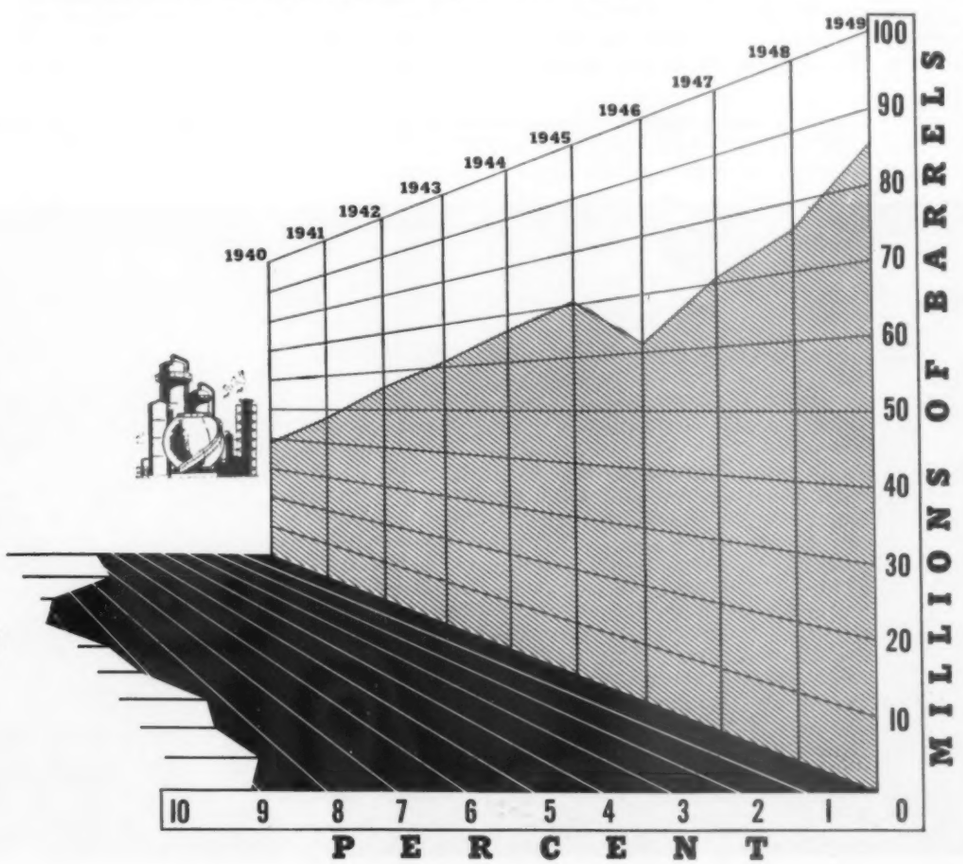
house brand. The jobber, with a lower cost, tends to seek more gallonage by passing on a part of his margin, and a depressed price area appears, affecting the profit on house brand gasoline of all companies. In most markets which become chaotic, there is only a small percentage of the total product which is causing the difficulty. In the case of natural gasoline markets, marketing students suggest that greater coordination in a few large companies could exert a considerable stabilizing influence.

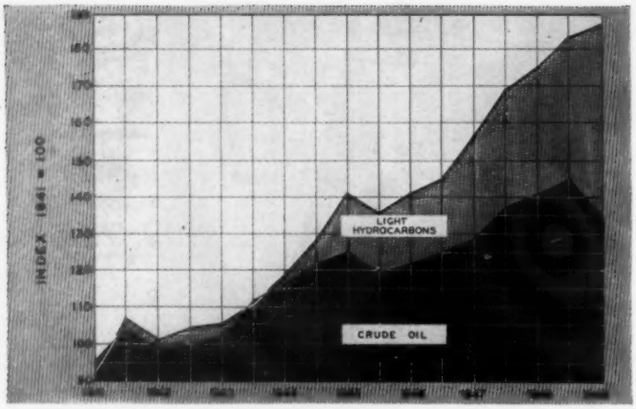
The importance of such stabilization in natural gasoline has grown rapidly since the war, as indicated in Figure 1. At the outbreak of World War II, production of natural gasoline in the United States was 0.041 barrel for each barrel of crude. The great demand for hydrocarbons during the war caused actual volume of natural gasoline to double from 55 million barrels in 1940 to 112 million barrels in 1945. Ratio of natural gasoline to crude rose from 0.041:1 to 0.065:1 in this period.

These figures do not tell the whole story because the construction of catalytic cracking plants in this period increased the volume of butanes available to the refiner so that his volatility requirements were reduced. Since the close of the war the octane race has assumed major proportions again, thus stimulating the erection of more cat crackers and increasing refinery butane production at the same time that conservation authorities have been forcing the rapid expansion of natural gasoline plant facilities.

In the five years since the close of the war, the natural gasoline to crude production has risen steadily until it now stands at 0.096 barrel of natural gas liquids per barrel of crude. The proportion of LPG to motor fuel components in the natural gas liquids has increased and served to mitigate the ratios cited to some extent. LPG constituted 36.5 percent of the natural gas liquids production in April 1950, as compared with 30 percent

Chart showing trend of natural gasoline production and the percentage of natural gasoline blended with refinery motor fuel. In 1943 more than 10 percent of refinery product was natural gasoline.





Crude oil and light hydrocarbon production indexes. Ratio of natural gas liquids to crude has been doubled since 1941. Chart courtesy Warren Petroleum Corp.

two years ago. Nevertheless, natural gasoline for motor fuel use increased from 11 percent in April 1949 to 11.8 percent in April 1950.

The Natural Gasoline Association of America has carried on a consistent campaign for many years to increase the use of natural in motor fuel. Road tests have been conducted under carefully controlled conditions to document the association's position that motor fuel of greater volatility can be sold without mileage loss and without vapor locking in properly designed cars. Experimental results encouraged one refiner to market a motor fuel last winter with a Reid vapor pressure on the order of 15 pounds in the Great Lakes area. Several marketed fuels in excess of 13.5 pounds in midwest marketing territory.

The association has been proposing to Technical Committee A of Committee D2 of the American Society for Testing Materials that the maximum permissible winter vapor pressure of ASTM specification D-439 be increased from 13.5 to 15 psi. Votes of three automotive members of the committee were in the negative, while the oil industry members were unanimous in their support of the proposal.

Automotive representatives are not yet convinced that the proposed increase will not have an adverse effect on carburetor icing, acceleration, warm-up and automatic choke behavior, despite the Nowata road tests. The industry points out that the automotive people overlook the difference between extensive volatility as indicated by the distillation curve and intensive volatility as indicated by the Reid vapor pressure test. Because of the firm stand taken by the automotive technicians, the Natural Gasoline Association regretfully receded from its former 15-pound request and asked a 14-pound maximum for 1950. Final vote tabulation was 34 for and six against the 15 pound maximum. On this basis Committee D-2 voted to approve the proposal so it now goes to the entire society for letter ballot. Chances are it will become a tentative standard on Nov. 1, 1950. It is anticipated also that 15 pounds may be recommended as a Federal Government standard. Attitude of the automotive people makes it apparent that the natural gasoline branch of the industry intensify its educational work.

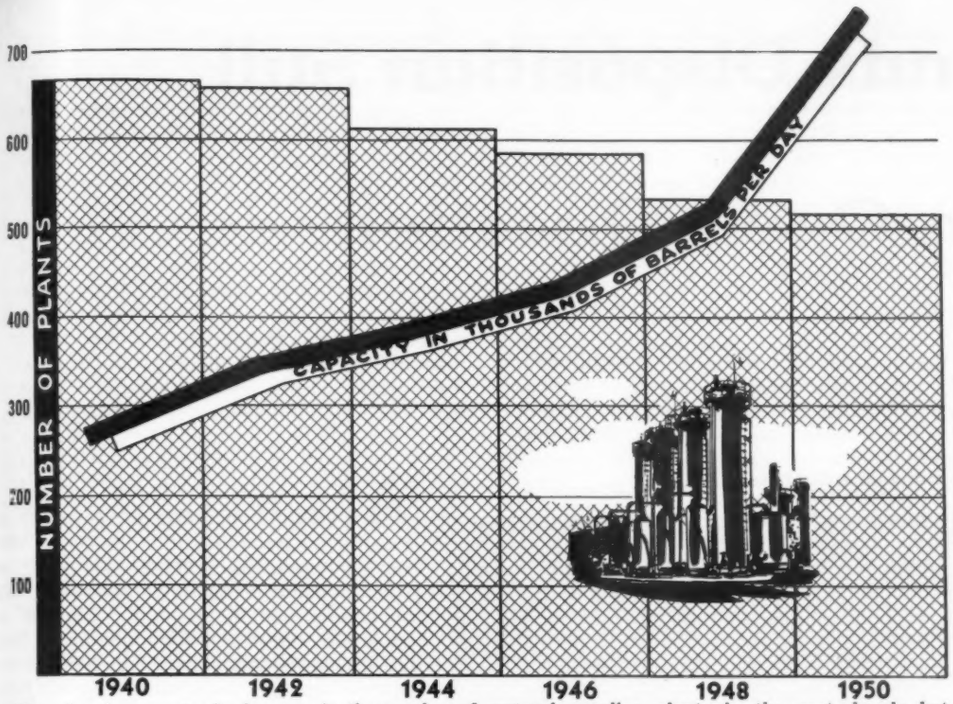
The highly satisfactory increase in motor fuel demand in the early summer plus the intensive sales efforts of natural gasoline interests have stabilized the natural market much sooner than had been anticipated by the pessimists a few months ago. Midsummer prices last year for 26-70 natural in Oklahoma averaged 5.5 cents per gallon. At the peak of the winter blending season, prices had advanced to 5.875. When stocks began to rise after the first of the year, the market dropped to five cents late in February and to four cents in March and April. The turn came during the first half of April, and by July prices had rebounded to 5.375.

In the last month or two of 1949 and the first half of 1950 a group of large gasoline and cycling plants have gone on stream, with an aggregate gas processing capacity of 675 million cubic feet per day. Magnolia Petroleum Co., for example, has completed four plants with a total capacity of 305 million cubic feet per day. Standard Oil and Gas Co. has completed three more plants which can process 150 million cubic feet daily. Shell has completed two new 30 million cubic-foot plants.

In these as well as in other projects recently completed, it should be mentioned that, while Magnolia, Stanolind or Shell are the operators, today's plants are jointly owned by a large number of companies. The 150-million cubic foot Magnolia plant in the Seeligson field is owned by 13 companies. Stanolind's 38-million cubic foot South Fullerton plant is owned by ten companies and five individuals, and its new Cowden plant, opened July 1, has 21 owners.

Postwar gasoline plants such as these mentioned have been equipped to produce very high recoveries of propane with the result that available supplies have been in excess of demand. LPGas markets consequently have not achieved the same degree of stability as has natural gasoline.

One of the notable projects completed in recent months is the group of plants in Garvin County, Oklahoma, operated by Warren Petroleum Corp. for a group of five companies. Pictured is the Maysville unit producing 220,000 gallons of products from 80 million cubic feet of gas. Photo courtesy Petro-Chem Development Co.



There has been a steady decrease in the number of natural gasoline plants in the past decade but capacity has risen consistently as operators group their interests in individual fields.

Propane production at gasoline plants, as shown in the following tabulation, has increased 55 percent in the past three years, more rapidly than the output of normal butane and mixtures.

Year	Propane (Barrels)	Other LPGas (Barrels)
1947	13,300,000	26,000,000
1948	18,500,000	28,200,000
1949	20,600,000	31,300,000

Sales of LPGas in 1949 totalled 67.5 million barrels. (This includes refinery as well as natural products.) The increase over 1948 was four percent, the lowest in recent years. Principal factor in limiting the rate of rise was the warm winter and increased competition of natural gas lines for industrial business. Industrial use decreased 10.5 percent last year, gas manufacturing was unchanged, and domestic use rose 13.9 percent.

For 1950 it is the consensus of the industry that industrial and gas manufacturing use will remain static. Chemical plant use is expected to rise around five percent on the basis of new plants and expansions now complete. Rubber manufacturing now is expected to expand during the last half of the year as the government increases its stockpile in anticipation of more trouble in the Far East. Last year synthetic rubber plants consumed 4.2 million barrels of LPGas, compared with 5.4 million barrels in 1948. This year's rubber demand still is conjectural.

Domestic installations which will use LPGas for cooking and space heating are going in at a rapid rate. Assuming that weather is normal in the fall and early winter, domestic demand for LPGas may be 20 percent higher this year than last. If the weather becomes severe, the industry will be in difficulties again.

Two or three years ago there was a strong drive to increase consumer storage, but this has been relaxed lately so that many small tanks are being installed. With winter-summer ratios of five to one or higher in the south, there is real trouble in store for all elements in the industry. It is not feasible for marketers and producers to build enough bulk storage to supply peak winter demands.

Study is being given to underground storage schemes, but these are useful only in providing future availability of product not now marketable. With LPGas tank cars costing upwards of $8,500 each, it is not economically attractive to build enough cars to move peak demand, when such cars may be idle one half of the time. In 1948 some 3,000 new cars were put in service, but deliveries last year and in 1950 have been at a much lower rate.

A few companies, such as Universal Petroleum with its "Uniplan," have been promoting consumer and dealer storage programs which will permit level delivery rates the year around. The "Uniplan" involves financing arrangements which are becoming easier as the industry is better recognized by bankers.

Automotive transportation is an attractive field for development and currently is being given much attention. A considerable number of city bus lines are adopting propane as motor fuel. Another attractive outlet is for tractor fuel. Recently a low-cost carburetor conversion unit has been devised which is developing a good summer load in the southwest.

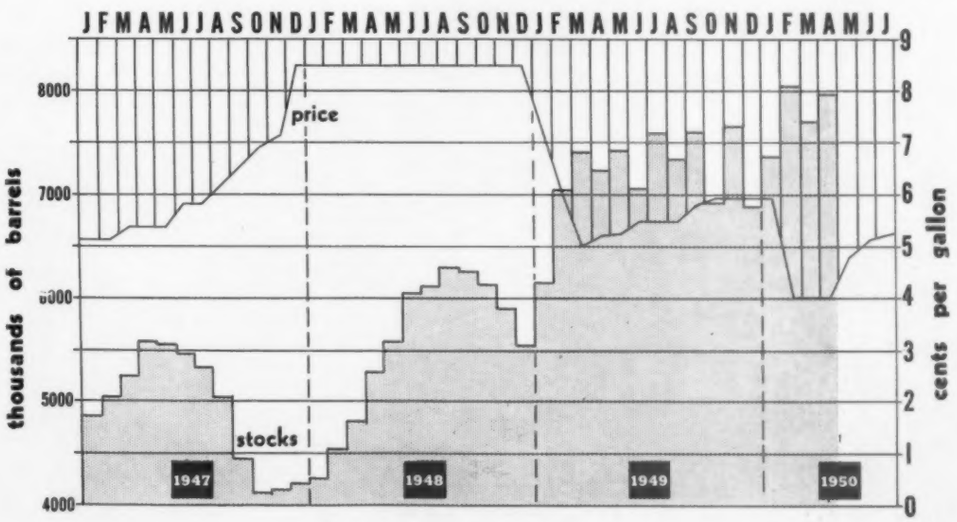
Propane prices in carload lots in the southwest are down to prewar levels or below. The present market price is only a third as high as it was two years ago. It is estimated by important marketers that the surplus today is only about five percent of the total supply. If this estimate is anywhere near accurate, the LPGas market may be expected to return to a more satisfactory level within the next year or so.

While new natural gasoline and LPGas manufacturing plants still are under construction and projected, it is generally conceded that the postwar flush is over and that increases in output will be at a more moderate rate in the last half of this year and in 1951. Largest new area in which new plants must be built is Scurry County, Texas. These cannot be completed this year.

The largest project yet announced for Scurry County area will be operated by Sunray Oil Corp. for 35 operators and casinghead gas owners cooperating in the area. Approximately sixteen 35,000 producing acres in the North Snyder, Kelley-Canyon and Diamond "M" fields are involved in the construction and operating contract covering development of the project. The plant will process approximately 67 million cubic feet per day and produce in excess of 450,000 gallons per day of liquid products. Contents of the gas is unusually high, and engineering analyses indicate that the plant will extract between seven and eight gallons of liquid products per MCF of gas processed. The plant should be in operation by the spring of 1951. Sunray is now installing high pressure gathering lines.

It may be said now that new light ends production will be largely consistent with increases in crude production, so that if the refining industry continues to use adequate quantities of natural, stability should not be too difficult to maintain.

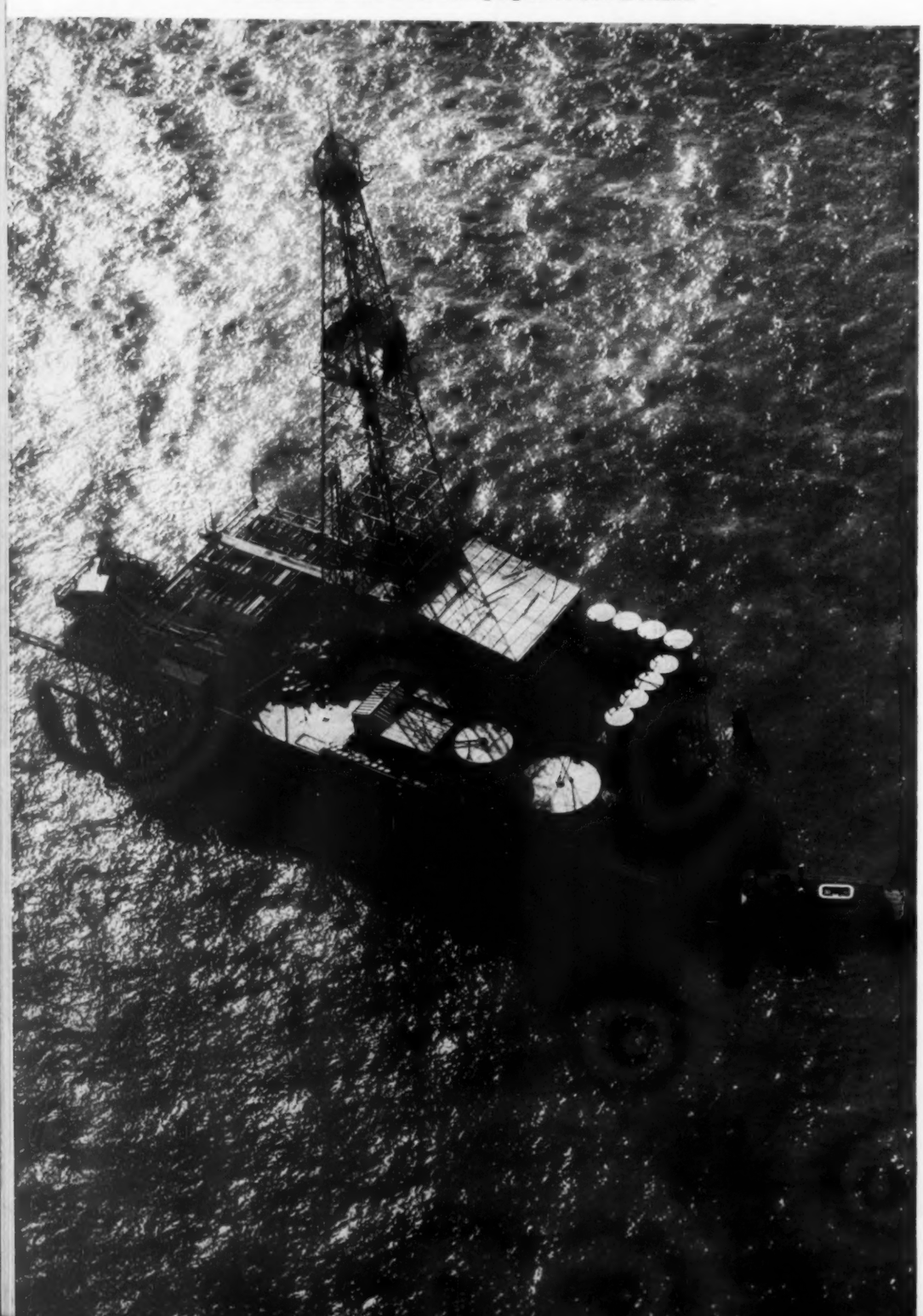
Stocks of natural gasoline reached a new high early in 1950. The drop in market prices earlier in the year now has been largely recovered.



Tidelands Disposition Still An Open Question

By JOSEPH B. HUTTLINGER

A Magnolia Petroleum Co. drilling rig in the Gulf of Mexico.



AFTER fifteen years of discussion, attempted legislation by Congress which was nullified by Presidential veto, and three sweeping decisions by the United States Supreme Court, the issue of "tidelands" oil remains a subject of controversy and is likely to continue in that state for at least another year and possibly much longer. To add to the confusion surrounding the issue, the term "tidelands" applied to it is definitely a misnomer. In its dictionary meaning the word applies solely to the strip of shoreland which

Chronology of "Tidelands" Controversy

Prior to New Deal regime—general assumption was that states controlled offshore areas. Only underwater drilling at that time was within tidal strip.

1933—Secretary of Interior Ickes agrees that control belongs to states.

1936—Secretary changes opinion and starts advocating federal control.

Aug. 19, 1937—Senate passes bill directing Justice Department to sue for title, but House fails to act.

Sept. 28, 1945—President Truman issues proclamation asserting authority of the United States over the subsoil of the Continental Shelf contiguous to the land area of the country.

Oct. 1945—U. S. Attorney General files suit against States of California to determine title to submerged lands alongshore.

July, 1946—Congress passes to White House state-control measure.

Aug. 1, 1946—President Truman vetoes the bill on the ground of suit pending before Supreme Court.

June 23, 1947—Supreme Court rules against California by vote of six to two in suit for control over bordering offshore areas.

Aug. 8, 1947—Interior Department says new law needed if it is to administer California's offshore lands. Justice Department agrees.

June 5, 1950—Supreme Court rules six to one against Louisiana in suit to establish federal ownership of submerged areas adjoining state in Gulf of Mexico.

June 5, 1950—Supreme Court rules four to three against Texas in similar suit.

is submerged at high tide and exposed at ebb. In none of the litigation that has gone on was this the real issue involved. As a short and convenient label, however, the term has come to be applied to all underwater regions within wide and varying distances from the actual shore line.

In earlier discussion the matter of distance from the actual shore line did not figure importantly. In accordance with general maritime usage the national government exercised police powers, the regulation of commerce and similar matters beyond a three-mile limit, while the protection of oyster beds, fish and game in nearer waters was left to state supervision. So far as oil was concerned, there was no occasion for more than a theoretical difference of opinion as to the division of authority. There was no drilling for oil except directional wells sunk from above the shore line and projecting out underneath the water or put down from piers extending out above the surface. It was not until the drillers began to push their operations further and further out into the shallow waters of the Gulf of Mexico, which in places extend many miles from shore, that the ownership of oil produced from such locations assumed practical importance.

The issue came very much alive in 1945 when the Attorney General of the United States filed suit against the State of California to "quiet" title to submerged lands along its coast. The matter was actively debated in Congress, and the Senate in July 1946 confirmed previous House action and sent to the White House a bill quitclaiming to the states title to submerged lands bordering their shores. This bill the President vetoed on the ground that no legislative action should be taken while suit involving the question was pending.

In June 1947 the Supreme Court handed down its decision in the California case. It held by a vote of six to two that the federal government had "paramount rights and full dominion over" the lands in question. One of the two dissenters, Justice Frankfurter, commented that the issue was one that could best be decided by legislation.

Since then the Court has twice reaffirmed its findings regarding California in suits brought by the Department of Justice against Louisiana and Texas, which were decided on June 5 last. In the former the federal government's claim was upheld six to one, in the latter four to three. Two distinguished justices seemed to feel that Texas, having come into the Union voluntarily as an independent nation, with specific retention of rights and authority previously attained, had a sounder basis for its contention than other states. Its defenders were quick to point out also that the decision was rendered by only four judges, an actual minority of the membership, and a bill has been introduced in Congress calling for action by more than half the members to make decisions binding.

The Court was consistent in its course. In the first case it held that paramount rights over submerged lands inhere in the federal government. If this was true for California, it's true for Louisiana, said the opinion written by Justice William O. Douglas in the subsequent cases. The national interest demands this finding, he said. As for Texas, it may have a better claim because of peculiar provisions regarding its entry into the Union. Nonetheless, "she became a sister state on an 'equal footing' with all the other states. . . . If the property, whatever it may be, lies seaward of low-water mark, its use, disposition, management and control involve national interests and national responsibilities."

In simplified summary, because the federal government owns California's marginal belt, it owns Louisiana's; because it owns Louisiana's, it owns Texas'.

The lineup of six to one in the Louisiana case left Justice Frankfurter dissenting. It was four to three in the Texas case, with Justices Stanley Reed and Sherman Minton joining in the dissent. Justices Tom C. Clark and Robert Jackson, former Attorneys General, took no part in the cases.

While the principle involved in the three cases was broadly the same, there were differences in details, as for example in the distances claimed by the states as within their jurisdiction. While California wanted only three miles beyond the low-water mark, Louisiana contended for a distance of 27 miles; Texas originally made a similar demand and then extended it all the way to the outer rim of the Continental Shelf.

Congress still has authority to pass a law reversing the conclusion arrived at by the Court, if it chooses to do so. Several bills designed to accomplish that result have been introduced during the current session, but none has been pressed to a final decision. While a majority of members, to judge by previous action, are in sympathy with the position of the states, the reason for inaction seems to be the virtual certainty that the President would veto any such bill, and the equal certainty that it would not be possible to muster the two-thirds support needed to override a veto.

As matters stand now, there are several loose ends that need to be tied up if the Court's findings are to be put into effect. In connection with the decision delivered last June, the representatives of the states and of the federal government were directed by the Court to submit by September 15 a form of final decree to carry into effect the opinions rendered. The Attorney General of Texas announced immediately after the decision that he would move for a rehearing, and such a motion might lead to delay. In California, following the decision in that suit, a temporary working agreement was made to prevent the suspension of operations in submerged areas. Private companies have been allowed to continue working under state leases, and the royalties collected from them are held in escrow pending final settlement. It is the function of Congress, however, to set up the machinery of operation if federal domination is finally to control. The whole subject from present indications is likely to come before the next Congress and to be threshed out again then.

The view that some legislative action is necessary to implement operation even though federal authority is to prevail is supported by the position taken by Solicitor Mastin G. White, who ruled in 1947 that the mineral leasing act devised for federal lands does not apply in the present situation and whose ruling was upheld by the Court. Conceivably the President might take the matter into his own hands and by-pass Congress by declaring the submerged lands naval petroleum reserves. But such arbitrary action might strengthen opposition and is not considered likely.

In view of the strength of the two opposing forces, an obvious way out is some form of compromise. Such a solution was proposed before the recent decisions of the Supreme Court. It provided for a recognition of state authority for certain distances offshore to be agreed upon and for federal domination beyond, also for the division of royalties between state and national treasuries on a 50-50 basis or possibly under an agreement that would give 62.5 percent to the states and 37.5 percent to Washington. Emissaries from the capital who put the suggestion before state representatives felt that they could safely assure the acceptance of such proposal by the President and his advisers. According to report, however, the position taken by one or two of the spokesmen for the states in flatly rejecting any form of compromise angered the President and caused him to direct that further efforts be dropped.

Oil men in general prefer state regulation to that of federal bureaus because they feel that state officials are likely to be more interested in developing resources on fair terms, rather than locking them up to some indefinite future time. As a practical business matter enthusiasm for deep-water drilling has cooled somewhat because of the heavy expense of such operations and the relatively meager results obtained thus far. As contrasted with the glowing picture painted by some of the more daring geologists a few years ago when they predicted that 100 billion barrels of oil could be recovered from the Continental Shelf, this more cautious attitude was expressed by H. H. Kaveler of Phillips Petroleum Company at a hearing before the House Judiciary Committee when he said:

"In conclusion, I wish to say, in my opinion, no forest of oil wells and derricks and platforms for drilling and producing is about to spring up in the Gulf of Mexico. The industry has invested some $175 to $200 million to obtain some 457,000 barrels of accumulated production and some 3,000 to 5,000 barrels per day of current production after drilling 56 wells."

Development of underwater areas undoubtedly will come in time, but it seems likely to come gradually and to offer no such bonanza as was once portrayed. Meanwhile, the question of final disposition of "tidelands" is still open to Congress for action.

Tax Bill Hearing

IN its hearing on the tax bill now pending in Congress, the Senate finance committee on June 10 took up the section of the bill which provides that losses arising from the abandonment of capital assets or property used in trade or business cannot be deducted as capital loss, except to the extent of capital gains during the same year plus $1,000. This provision would bear heavily upon the oil industry because of the necessity of frequent

(Please turn to page 62)

Pechelbronn Area Enters New Expansion

By E. A. Bell

Deep test well in Pechelbronn area. Photo courtesy Universal Trade Press Syndicate.

EXPANDING activities in connection with France's one historic oil field, Pechelbronn, bid fair to restore that area to its former position or even to raise its production to new high levels, if funds and equipment can be provided for the enlarged drilling program that has been proposed.

It will be recalled in this connection that the original Pechelbronn workings, now confined within an area of 61,775 acres, yielded some 3,000,000 metric tons of crude oil in the last 60 years. This oil originated exclusively from Tertiary layers. It was, however, found that the discontinuity and irregularity of the oil sands constituted a considerable obstacle in the way of any further development, although, on the other hand, those same factors worked in favor of a long working life of the deposits concerned. The method of working adopted in the Pechelbronn area was twofold, covering both tunnelling and pumping. Tunnels drilled during the 60 years under review totalled more than 186 miles (300 km), and more than 5,000 pumps were installed during the same lapse of time.

The course of operations at Pechelbronn from the prewar period through the devastation of

Partial view of Pechelbronn plant in pre-war period.

German occupation and the recovery of the postwar years is indicated by the accompanying tabulation originated by the Strasbourg Chamber of Commerce:

Output Metric Tons	1937	1945	1946	1947	11 Mos. 1948
Crude oil	70,250	27,291	51,427	49,279	48,141
Petrol	20,188	869	4,207	3,755	3,458
Refined oil	33,806	.....	6,748	11,249	(1)
Diesel, lubricating oil	25,757	4,481	11,311	10,887	.....
Oil tar	9,584	1,018	8,103	8,259	6,793
Oil coke	6,935	277	184	181	44.9
Kerosene	15,630	1,657	3,601	2,361	.....

(1) White spirit 626 metric tons; light kerosene 2,252.8; diesel oil 9,805; fuel oil 3,467; light oils 5,635; heavy oils 8,292.7; black oils 914.1 metric tons.

Among other improvements since the close of the war has been the reconstruction of the company's refinery at Mertzwiller, accomplished largely by its own labor but requiring an investment of a million francs.

Production for 1949, while not expected to approach the prewar level, reached approximately 57,000 metric tons with December estimated. It was aided by oil prospecting to the east of Pechelbronn, in the Département du Bas-Rhin, carried out by the Pechelbronn Société Anonyme d'Exploitations Minières, which led to the location of a productive oil well near Soultz-sous-Forêts in July last. Soultz-sous-Forêts is 31 miles to the north of Strasbourg on the railway line which connects that town with Wissembourg, France's northeasternmost railway frontier station. Oil was found at a depth of 2,830 feet (863 meters) when a layer of Triassic limestone was reached. Initial output was estimated at some 500 metric tons (3,600 barrels) for the first 24 hours.

In connection with this promising development the Pechelbronn company issued a statement which said that production attained 1,000 cubic meters or 6,300 barrels and that the crude was of fine quality resembling that obtained in the best oil areas of Pennsylvania. Furthermore, the fact was emphasized that the discovery had been made possible by the use of a modern drilling rig and that, while the position justified a certain amount of optimism, the further development of the new area was dependent upon placing in service additional modern plant which the company was endeavoring to secure with the help of the authorities concerned.

In prewar years drilling by the Pechelbronn company in the area of its concessions covering some 25,000 hectares (61,775 acres) did not extend below the Tertiary zone. Even before the start of World War II it was proposed to explore deeper horizons. The outbreak of hostilities delayed such action, but in 1947 the first such well to give encouraging results yielded some 750 barrels per day. In view of the favorable prospects from deeper drilling indicated by the discovery at Soultz-sous-Forêts, negotiations were begun in the latter part of 1949 with private interests in the United States, looking to a loan of $300,000 for the purchase of additional equipment. While this proposal brought no immediate result, an agreement was concluded between Pechelbronn S.A.E.M. and the French Bureau de Recherches de Pétrole, having as its object the financing of the company's further exploratory activities within the boundaries of its concessions and bearing, in the main, on the horizons of the secondary zones which have given rise to most hopeful promise. The program envisaged by the agreement is reported to extend over six years and to fix the financial and technical particulars which are to govern the financial assistance to be accorded by the Bureau de Recherches de Pétrole. These enhanced activities are to be particularly concentrated on the Soultz-sous-Forêts region. In view of the participation of the Bureau de Recherches, the company is bound to shoulder a larger investment through increase of its share capital from Francs 397,880,000 to Fr. 1,200,000,000. This increase is to be carried out in one transaction or by installments at the option of the board. The name of the new concern has been given as FINAREP, short for Société Financière pour la Recherche du Pétrole.

These expanded investments are, of course, closely connected with the company's financial results. In 1948 the net profit of Fr.33,255,657 exceeded by some 15 percent that of Fr.28,977,834 in 1947, and the amount available for distribution in respect of 1948, increased by the balance of Fr.13,406,665 carried over from the preceding year, was Fr.46,662,322. This enabled a gross dividend of Fr.40 a year (net Fr.32), the same as for 1947, to be paid on the share capital, although the latter had been increased in the course of the year under review from Fr.170,250,000 to Fr.397,880,000. It was stated, however, that these favorable results, while largely the outcome of the improved working conditions and increased output, were to a considerable extent due also to the profits derived from subsidiary concerns or branches. These interests, however, became dissociated from Pechelbronn S.A.E.M. in recent months through their transfer to Société des Huiles Antar. The participations so transferred had been in the following concerns: Raffineries Françaises de Pétrole de l'Atlantique; Société Alsacienne des Carburants; Société Française des Pétroles, Essences et Naphtes; Compagnie des Transports Rhénans; and Société Franco-Belge d'Entreposage de Pétrole. This concentration of the various Pechelbronn participations within one concern was followed by the amalgamation between the Société Alsacienne des Carburants (SOCAL) and the Société des Huiles Antar through the absorption of the first-named by the latter. The extension of the Pechelbronn company's activities into other, though correlated, fields, begun after 1930, has thus come to an end. That policy of scattered participations had been, in part at least, favored by the government of the time in connection with defense considerations, leading also to the establishment of a subsidiary known as Pechelbronn-Quest Société Anonyme, at Donges, and to a special interest in the Brest-Port-Petrolier concern. The severance of these varied interests and participations from the Pechelbronn company proper has enabled the latter to concentrate its activities exclusively on its principal object of exploration for and production of crude oil.

On the other hand, Régie Autonome des Pétroles, the French Petroleum Board, has been authorized since August last to secure a participation of up to five percent in the share capital of Pechelbronn.

The presence of oil in the Pechelbronn area was first discovered as far back as the end of the 15th century, but not till the thirties of the 18th century were the first wells drilled and the commercial exploitation of the deposits so tapped begun. Subsequently the French government leased the area to a certain Monsieur de la Sablonnière. His successor, Monsieur Le Bel, intensified the workings and secured the first "Pechelbronn" concession in 1801. Activities were further enhanced after the location in 1882 of additional oil deposits in the same region when concessions for the exploration of some 213,568 acres (86,430 hectares) were granted. In 1889 the German Pechelbronner Oelbergwerke A.G. took over the Le Bel concessions and introduced a more modern way of working by substituting the extraction of crude oil from wells by means of pumps for the former methods based on the driving of horizontal tunnels. From the purely financial side of the venture, it was a success earning dividends of up to 30 percent. In 1906 the concern was taken over by Deutsche Tiefbohrgesellschaft Nordhausen, subsequently converted into Deutsche Erdöl A.G., and distributing dividends of up to 23 percent. When during the 1914-18 war, Germany endeavored to increase the output from the Pechelbronn areas under her control, the old tunnel method was reverted to and the output approximately doubled.. In 1913 the output of crude from the Pechelbronn fields totalled 49,584 metric tons, compared with only 4,000 metric tons in 1882.

As an outcome of the 1914-19 war the French government seized the Pechelbronn oil workings and leased them subsequently to Pechelbronn Société Anonyme d'Exploitations Minières for 99 years.

Drilling from mine level at Pechelbronn. Photo courtesy Universal Trade Press Syndicate.

Front view of the Royal Dutch-Shell laboratory buildings, Amsterdam.

Research Activities of Royal Dutch-Shell's Holland Laboratories

ACROSS the River Y from the central railway station in the Dutch capital, Amsterdam, stands a block of massive buildings. Its simple, severely utilitarian lines suggest that it may house some large manufacturing plant. In reality, however, it contains the laboratory, or, more accurately, the series of laboratories of that world known oil organization, the Royal Dutch-Shell. It is the workshop of hundreds of scientists, investigators and experimenters whose energies are devoted to oil, studying its properties, analyzing its components and developing from it new uses and improved products. From it have come many important contributions to the rapid technical progress of the industry.

The site on which the laboratories now stand has a rather unusual historic background, for when the petroleum industry first set foot on the then bare bank of the river, it had for many centuries been so quiet that it had become a bird sanctuary. Moreover, the Amsterdam gallows was located in this area, which was considered a most suitable place in which to abandon the bodies of executed criminals to their ultimate destruction.

This undisturbed quietude prevailed up to 1870, when the "inflammable rock or mineral oil," also called petroleum, was brought to Amsterdam among other places.

Since the new and somewhat mysterious product was looked upon as being dangerous, the city authorities objected to its being stored in existing depots, and it was banished to the opposite bank of the Y where it could do no harm, even if fires or explosions were to occur. The situation at present is quite different: "the other bank of the Y," as it is called, has developed into one of the most important industrial districts of Amsterdam, with a population equal to that of a substantial provincial town.

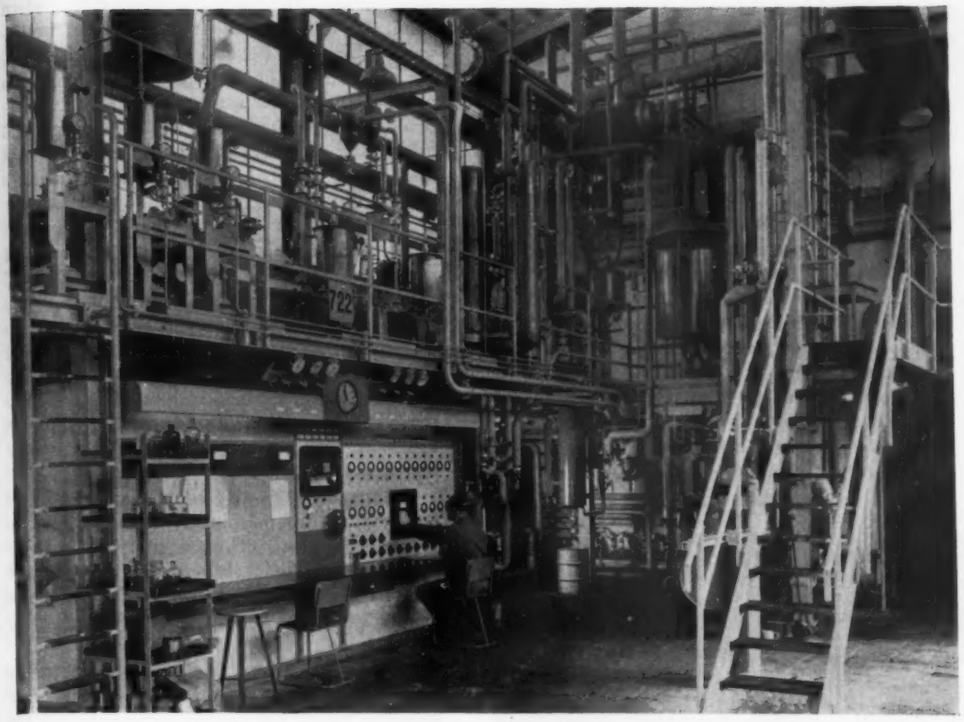
Later on the oil industry established in this area a depot and a wax refining plant, and in the course of years also set up facilities for examining the properties of the products supplied. In 1911 this depot was taken over by the Royal Dutch-Shell. Three years later the foundation stone was laid of a one-story building, which, with its eleven laboratory benches, five experimental stills, five fuming cupboards and one titration rack, constituted the modest beginnings of the present laboratory. The reason for originally establishing the laboratory in Amsterdam was quite simple: the depot contained power plants and a boiler house, which are both indispensable to a laboratory.

In those days, around 1920, the staff numbered 37 only, but one year later the number had increased to 53. Various extensions were built and another floor added to the laboratory. The increase in personnel continued and in 1935 nearly 800 people were employed in this laboratory. Since World War II the number employed has risen to nearly 2,000.

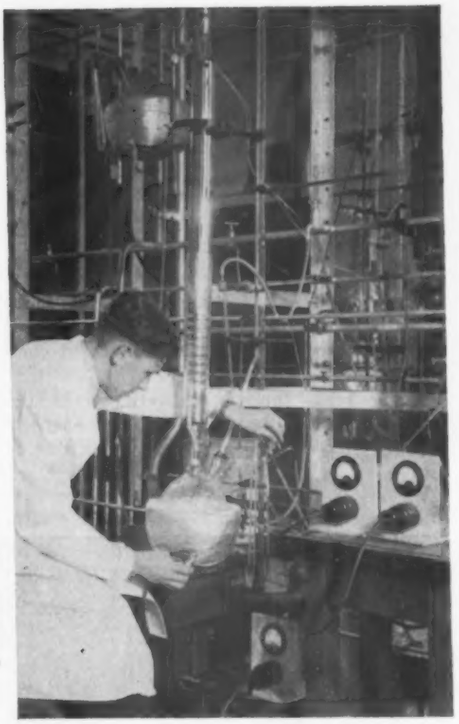
After 1920 the development of the petroleum industry made truly rapid strides, which fact was reflected in the growth of the laboratory. In 1930 its capacity had to be increased again, and this resulted in the erection of a new building many times larger than the old one. It was hardly completed when another wing had to be added. The construction of a hydrogenation laboratory and the large research laboratory with pilot plants, which was started in 1939, could not be completely carried out owing to the outbreak of the war, but the work was energetically resumed after the war.

This brief historical outline is essential for the purpose of demonstrating that the growth of the laboratory is advancing *pari passu* with the possibilities of utilizing petroleum products. In other words the laboratory first adapted itself to the industrial requirements with regard to testing the properties of the products, the properties themselves being dictated by practice. At most the laboratory carried out a simple test as regards the improvement of refining methods. When, however, around 1925, much higher demands were made on the products, for example, the higher quality requirements for gasoline, the Amsterdam laboratory could not lag behind. To realize its purpose not only scientific guidance, but also a large staff and extensive equipment was needed, which accounts for the rapid increase of staff and buildings.

Although formerly the work of the laboratory was more or less a step behind produc-



One of the pilot plants, Royal Dutch-Shell laboratory.



Distilling liquids with the aid of a modern laboratory-column.

tion, it is now years ahead of it. The development of various processes up to the point of manufacture on a commercial scale involves much time and money. One might say that it is not by pure accident that this laboratory stands in the town where of old the merchants had adopted as their slogan: "De Cost gaet voor de Baet uyt." (Nothing venture, nothing have.)

The laboratory still keeps a watchful eye on the production of finished products, but it has numerous other tasks, which will be briefly discussed and illustrated with an example.

The first task includes the improvement of processing methods and the development of new physical processes such as the improvement of the extraction process. As early as 1907 Edeleanu discovered that undesirable components could be removed from kerosene by extraction with liquid sulfur dioxide. When applied to lubricating fractions, this process was found to have several drawbacks, which led successively to the discovery of new extracting agents, for example furfural, and new processes, such as the rectiflow process and the so-called Duosol process, in the latter use being made of two extracting agents. This resulted in more satisfactory lubricating oils being put on the market.

A more profound knowledge of the structure of asphalt bitumen brought about an improvement in the processing methods. By oxidation (blowing), distillation and precipitation, or a combination of these processing methods, bitumens could be produced which are particularly suitable for some purposes, such as road building, pipe protection, floor covering and paint manufacture. By emulsifying asphalt bitumen in water, valuable products have been obtained for application in hydraulic engineering, the so-called Shell perm process, and in the paper industry.

The second task arises from the desire to improve existing products of long standing and repute. One notable achievement was the production of gasolines with a very high octane number for aircraft engines by using an admixture of certain compounds. Recently the synthetic production of hydrocarbons, such as iso-octane, from cracking gases and by other methods has made great strides. Yet another achievement of the laboratory was the development of high-grade lubricating oils which can withstand very high pressure, keep the motor clean and which, moreover, possess marked anti-corrosive properties.

The production of more satisfactory gasolines and lubricating oils necessitated the construction of engines which could fully profit thereby, while on the other hand special engines called for suitable fuel and lubricants. The outcome of this is that the work done in the laboratory and the development of the explosion engine are being kept in step.

The load to which two engine parts are subjected may be so excessive that the ordinary lubricant is quite inadequate. In this case the demands made on the mechanism are, therefore, dependent on the quality of the lubricating oil. By the inclusion of the so-called additives, the lubricating oils may be rendered suitable for excessive pressure lubrication. In this connection may be mentioned the hypoid gear wheel which makes it possible to keep the rear axle of a modern car as low as possible. But for the proper additives which impart to the lubricating oil the desirable properties called for, it would have been impossible to use this gear wheel on account of the excessive stress occurring between the metal parts.

One of the most characteristic of recent developments is the birth of an extensive chemical industry in which petroleum and its derivatives are used as base materials. In this connection the laboratory was instrumental in the development of polyvinyl chloride (PVC) as a plastic and of sodium alkylsulfates, which play a prominent part in the production of washing agents which will be manufactured on a large scale in the Netherlands. This will not, however, put an end to the work of the laboratory. The manufacture of numerous valuable chemical products based on petroleum holds out a very wide prospect.

A fourth task of the laboratory is the development of suitable testing methods in connection with scientific petroleum research. Petroleum is not a simple substance but a mixture of the most divergent low to high-molecular hydrocarbon compounds. No means should be left untried to ascertain the true nature of the structure of these hydrocarbons, the more so in view of the inadequacy of the current analytical methods. In this connection the optical analysis, by which it is possible to ascertain the structure of hydrocarbon compounds, is of interest. This method may, however, be further developed.

Service constitutes the fifth task of the laboratory. Difficulties occurring in the processes of the various refineries must be solved as quickly as possible, while advice must be given to the sales organization of the Group to be passed on to the consumers of the products.

The work of the laboratory not only consists in finding new methods of application or a more satisfactory product, but also in developing new processes for the manufacture of the product on industrial lines. In order to solve this problem, pilot plants have been erected in which the necessary experience is gained on a semi-technical scale prior to manufacture on a commercial scale.

Aside from the main research center at Amsterdam the Royal Dutch-Shell Group has

a specialized laboratory located at Delft, Holland. Before the war this laboratory, maintained by the Bataafsche Petroleum Maatschappij, had been primarily engaged in the testing of petroleum products, which work has now for the greater part been taken over by other laboratories of the Group. After the war other work was, therefore, assigned to the Delft laboratory, since more attention is being paid to the interaction between fuels and lubricants on the one hand and to engines, burners and gear wheels on the other hand. These problems call for fundamental research in regard to the physical and chemical phenomena underlying the processes of combustion and lubrication.

Along with fundamental studies in the sphere of combustion and lubrication phenomena, thereby widening the scope of a line of investigations already entered upon before the war and providing for more profound investigation of the problems involved, research and development in regard to the working equipment of the Royal Dutch-Shell Group itself now ranks high in importance. This again calls for an extension of fundamental research work, which in many respects provides a good link with the studies made in regard to combustion and lubrication phenomena. Aerodynamics in particular constitute the basis of so many problems, such as flow resistance, atomization, mixing, heat transmission, that they form to a large extent the basis of the entire present program of the Delft laboratory.

The direct fields of application range from improved burners, applied in the Group's oil refineries, to atomizers, to be employed for insecticides. Of great importance to modern refineries is the measuring and control equipment which finds ever-increasing application. In addition to the testing of new European products, including those made in the Netherlands, the development of control systems and measuring instruments for special purposes also forms part of the program. Furnaces for certain reactions which take place at very high temperatures, and other reaction apparatus, are being developed on the basis of new ideas and in the light of newly disclosed facts. Special attention is being paid in the laboratory to the process known as fluidization which was developed in America during the war, whereby a whirling motion is imparted to finely divided solid substances. Experiments in the field of heat transmission are being conducted in a special testing installation.

Great activity is also being displayed in the domain of pure mechanics, viz., the development and testing of more powerful gas engines and other machinery for oil fields, of special high pressure pumps for sand-containing or corrosive liquids and various other applications.

Among the special tasks entrusted to the Delft laboratory may be mentioned the construction of an instrument for measuring the thickness of the inner bitumen lining of water conduit pipes. The thickness of this bitumen layer at six different points on the circumference is measured automatically by electrical means; a warning signal indicates when and where the layer is too thin.

The Delft laboratory employs a staff of more than 150 persons, including 25 university graduates. The growing need for more working space has been met in a successful, though sometimes provisional manner. The altered conditions have given rise to a highly modernized mechanical workshop, fully equipped for dealing in an expeditious manner with any and every request for special types of apparatus.

Laundering samples of fabrics to test efficiency and effect of new detergents.

An emission spectrograph using film for analyzing purposes.

Glass blowing one bulb within another one at Royal Dutch-Shell laboratory.

Basic Research Needed By Geophysics

By DR. O. W. WILLCOX

It is now understood that most of the easy-to-find petroleum accumulations in the United States have been or are being worked and that the problem of finding new accumulations is requiring more effort at larger cost. This fact is not at the moment particularly disturbing, because the industry is still fully meeting the country's large and expanding requirement for oil products and is making annual additions to the potential known reserves of this vital commodity. But the fact remains that new oil is harder and more costly to find, and the prospect for continuing discovery seems to be coming under the law of diminishing returns and may be approaching a final limit. That limit is now apparently still far off, but it is real enough to haunt the thoughts of far-seeing oil men and particularly of the geophysicists and geologists on whom the industry—and the public—must rely for continuance in the finding of new supplies.

This theme permeates the Seventy-Fifth Anniversary volume (No. 4A) issued by the Colorado School of Mines under the simple title, "Geophysics," (Colorado School of Mines, Golden, Col., October 1950; $1.00), containing papers by Cecil H. Green, R. Clare Coffin, Hans Lundberg, H. C. Doll and Maurice Martin, D. H. Clewell and Sigmund Hammer, all of them well-known geophysicists.

Mr. Green leads off with an exposition of the relationship of research and field operations in seismic exploration. The burden of his complaint is that reflection seismography, which has become the main reliance of the scientific oil prospector, appears to be heading into a stalemate. The gravity meter and magnetometer are useful as a common means for dividing a region into areas of positive and negative interest, but in the vital matter of selecting sites for exploratory drilling, the reflection seismograph has to be called in.

This instrument made its first appearance in the late twenties at about the time that the torsion balance and the refraction seismograph, after some spectacular success in some fortunate locations, had diminished in effectiveness to the point where they were almost discarded. From then on, the reflection seismograph took the lead until the current number of reflection parties operating in the United States is about 500, and for this service the petroleum industry is paying direct expenses at well over the rate of $100 million a year.

In the 20 years since 1930, the reflection seismograph has undergone continued improvement and is finding structural anamolies that were beyond the scope of the earlier models. Nevertheless, the geophysicists are becoming aware that this instrument is unable to delineate some situations that could have an important influence on underground accumulations of oil. It is well known, for example, that stratigraphic traps may be, and in many notable cases are, of greater importance than structural traps.

The seismograph may detect the presence of two hard layers enclosing a porous one, but it has little or no success in determining if and where they converge to form a stratigraphic trap. It works beautifully in regions where the subsurface structures are in high relief, but when most of the structures are low-relief areas of small areal extent, it is all too easy to miss a structural situation that could be of importance, unless the shotholes are spaced very close together. This, of course, raises the cost of seismic exploration, which makes the average oil company wish for a cheaper method.

Then there is the difficulty presented by surface faults, deep-seated and overthrust faults, and the thinning of individual elements of highly laminated sections of irregular lithology, which present the geophysicist with a complex record that he can hardly resolve, if at all.

The ratio of these difficult situations to the easy-to-find ones is constantly increasing, and the seismographer is more and more conscious that he is approaching a boundary that he will be unable to cross, unless the basis of his method is improved. That is to say, the seismographer needs a better theoretical insight into the principles that control the passage of energy waves through the diversified elements that constitute the earth's crust, so that he may see orderly sequences in seismic records that hitherto have presented only a blurred picture.

As was said above, the construction of the seismograph and the technique of its use have been greatly improved down the years, but there has been little corresponding progress in knowledge of the principles by which it works. In recent years practically every presidential address before the Society of Exploration Geophysicists has bewailed this lack of progress on the theoretical side, with insistence on the need of discovering some new and significant characteristic of the earth's crust for the seismographer to measure.

It is a fact that the majority of seismographic operations are now in a zone of poorer-quality data and not far from the frontier between usable and unusable raw-field data. Thus the seismographer's problem is more and more one of pushing back this frontier. In fact, there is no alternative if the industry is to maintain the present domestic oil-finding rate without the benefit of some radically new method. In its present stage, seismography is more of an art than a science. It is facing a challenge to convert itself from an art to a science by improving its instrument designs and its field techniques.

Research is, of course, the best answer. It seems natural to follow two avenues: first, the short range or development type of research, wherein improvements are sought in equipment design, in field instrumentation and in methods for handling the resulting data; second, the long-range or fundamental type of research, where the principal objective is to analyze quantitatively the many factors influencing the generation, transmission and reception of elastic waves in the earth. It is short-range or development type of research that so far has been responsible for bringing the reflection seismograph to its current stage of effectiveness as an exploration device. The seismographer's current ability to locate structural anomalies of decreasing amounts of relief and areal extent, in spite of increasing depths, is a creditable engineering accomplishment.

However, it has been remarked that this kind of progress seems to be approaching a stalemate. If the seismographer is to solve new and apparently more complicated geological problems, he must be supported by a greater proportion of research effort directed toward fundamental investigations. There are a number of situations toward which this kind of investigation should be directed.

In addition to those already mentioned, there is need, for instance, of a method for accurate determination of the outer boundaries of interior salt domes, like those in east Texas. Another is the problem of the complete failure to date to work certain domestic areas, as in the Delaware basin of west Texas, where the frequency of interfering energy waves seems to overlap completely or mask all likely reflection frequencies. The greater part of Florida is another example, the difficulty in this case being apparently excessive energy absorption by the coral rock section.

Many seismograms in current reflection surveys show records of circumstances that are not understood, but which should be diagnosed and, if possible, controlled, because of their varying influence on the so-called normal reflections. Multiple reflections are an important example, as around Chico in California. Then there is a very common phenomenon which is familiar to every seismographer but has never been satisfactorily explained: when several seismometers connected with a multichannel amplifier are interconnected on the ground, there is sometimes perfect duplication of records, but there are plenty of instances where there is complete absence of duplication. Why?

It is desirable that fundamental investigation should be conducted apart from production operations. The investigators should be men who rate high in the combination of curiosity and imagination tempered with common sense, and working through a field-service engineering group with parties operating in the field and supported by a competent development staff in the laboratory. Such groups should be given the widest latitude in selecting and following their line of attack.

Finally, the industry should lend its aid to the selection and education of men of natural ability to carry on this kind of research from colleges where there is opportunity to specialize in mathematics and physics in relation to the principles on which seismography depends.

Phillips Chemical Co. Cactus plant at Etter, Texas, 60 miles north of Amarillo, produces large quantities of anhydrous ammonia from natural gas and air. Construction has just been completed for manufacture of ammonium nitrate fertilizer and nitrogen solutions.

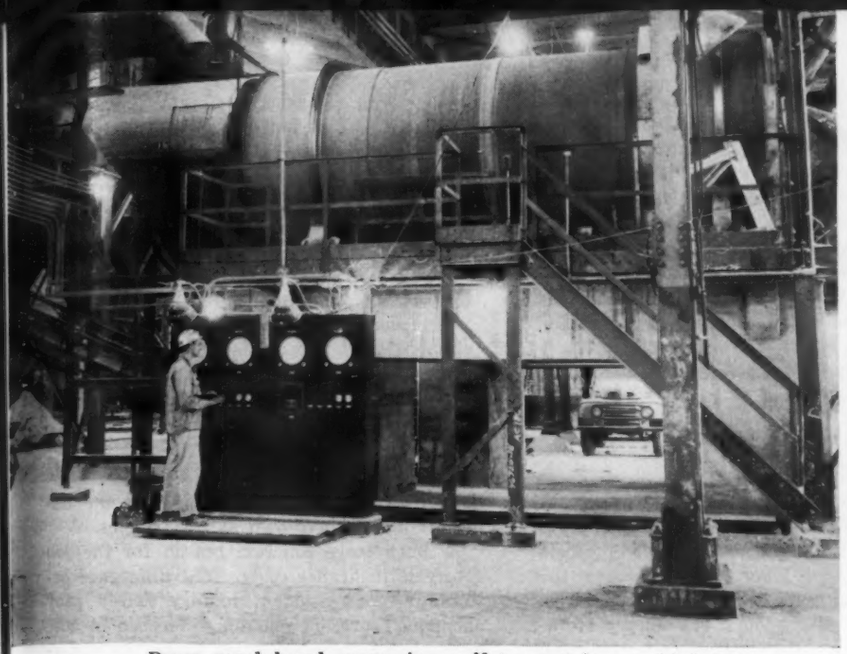
Petroleum Grows More Crops

Phillips Chemical Company's ammonium sulfate plant at Port Adams, near Houston, Texas. Production, storage and public shipping facilities are available.

WHETHER we believe that the world's petroleum was produced eons ago by decaying vegetable and animal matter or not, it is a fact that petroleum is now serving an important role in producing living vegetable and animal matter. And not alone by lubricating and powering labor-saving farm machinery. Petroleum—in the form of natural gas—can be made to release the element, hydrogen, which when combined with a part of the abundant supply of nitrogen in the earth's atmosphere supplies our farmers with one of the essential plant foods, nitrogen-containing fertilizer.

Phillips Chemical Company, a subsidiary of Phillips Petroleum Company, has recently completed a phase of construction at its Cactus Plant, near Etter in the Texas Panhandle, which doubles the anhydrous ammonia (NH_3) capacity of that plant, acquired in 1948 under a long-term lease from the government. This Phillips plant now manufactures daily about 880,000 pounds of NH_3. In doing so, Phillips uses 11 million cubic feet of natural gas for raw material, 27 million cubic feet for furnace fuel and six million cubic feet for compressor engine fuel—a daily requirement of 44 million cubic feet of natural gas!

This daily production of anhydrous ammonia may be translated into an annual production of about 125,000 short tons of nitrogen or very close to one-tenth of the total



Dryer panel board—ammonium sulfate crystals are dried to a moisture content of about .01 percent in large rotary dryers. Temperature of the crystals is being recorded at Port Adams plant.

Loading bags of ammonium sulfate fertilizer for overseas shipment from Port Adams, Texas.

United States agricultural consumption in 1948.

The Phillips operations are not limited solely to the manufacture of ammonia. Pressure tank cars of the liquefied ammonia gas roll in a steady stream to Port Adams (the former Todd Shipyards) on the Houston ship channel. There, the ammonia is reacted with sulfuric acid to produce ammonium sulfate in crystalline, easy-to-handle form. This modern plant is capable of producing about 800 tons of ammonium sulfate per day or over 260,000 tons per year of a 21 per cent nitrogen content material which is particularly suitable for direct use as a fertilizer or for further blending by mixed fertilizer producers in the preparation of complete plant foods.

Still another large manufacturing plant, adjacent to Cactus, has just begun production of ammonium nitrate at a daily rate of 300 tons, the equivalent of 100,000 tons per year of a 33.5 per cent nitrogen fertilizer. Nitric acid, produced by oxidation of ammonia, is neutralized with more ammonia to form a concentrated ammonium nitrate solution. This product is solidified in a "prilling" process to produce small globular pellets or spheres. These prills are coated with an inert inorganic powder to reduce the water absorbing tendencies of ammonium nitrate and to produce a free flowing, dry material which is easily handled and distributed to the soil.

A part of the ammonium nitrate production, prior to prilling, is diverted to the production of nitrogen solutions. These solutions are aqueous solutions of ammonium nitrate fortified with additional quantities of anhydrous ammonia to produce various standard high nitrogen content liquids, which are used by mixed fertilizer producers.

For those in the petroleum industry not associated directly with farming it is pointed out that nitrogen is one of the three principal plant food elements, the other two being phosphorus and potassium. It is nitrogen that plays a powerful role in increasing crop growth and yield. It is nitrogen in the soil that is transformed into the amino compounds in grains, vegetables, fruits and other crops to provide man directly with the protein requirements in his daily diet or indirectly through the meat and meat by-products (such as milk, butter, cheese and eggs) which he eats. To cite more dramatically the importance of nitrogen to food production, an extra bushel of corn can be produced under favorable growing conditions for every two pounds of nitrogen used. If the entire annual nitrogen output of the Phillips operations, 125,000 short tons of nitrogen, were used in this manner it would result in the production of 125 million bushels of corn! Or, using the generally accepted ratio that 10 bushels of corn may be converted to 100 pounds of pork, here is a new source for an annual production of 1,250 million pounds of pork! Obviously, the agricultural applications of nitrogen are widely diversified.

Phillips Chemical Co. is providing the farmer directly or indirectly with four valuable nitrogen products:

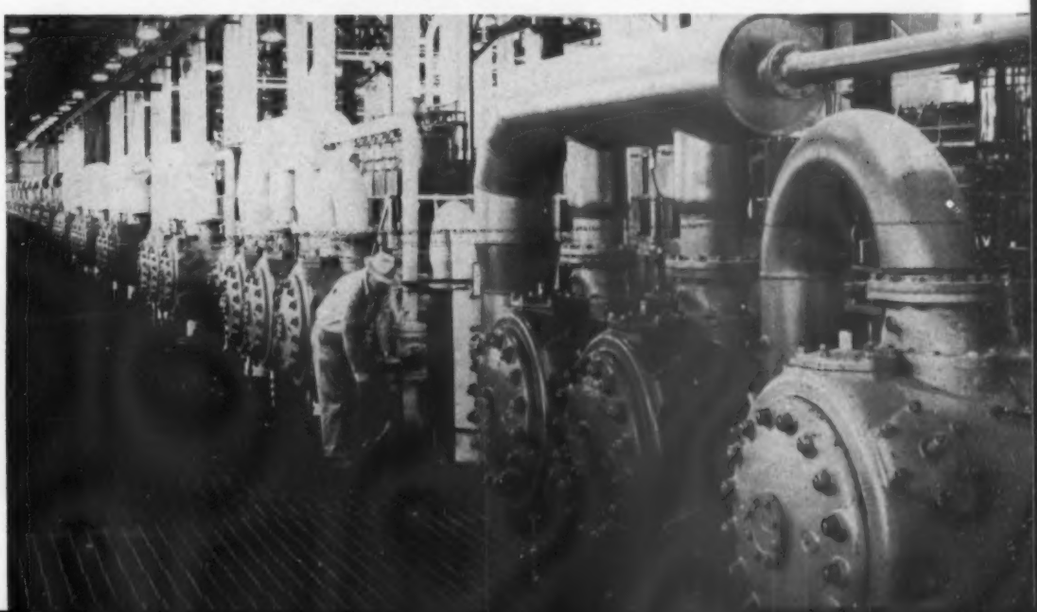
(1) Anhydrous ammonia
(2) Ammonium nitrate
(3) Nitrogen solutions
(4) Ammonium sulfate

The first three are produced in the integrated plant operations in the Texas Panhandle; the fourth, in facilities conveniently located on the Houston ship channel. The ammonia and solutions are distributed domestically by tank car and tank truck; the ammonium nitrate in 100-pound bags moves out of Etter in trucks or box cars; and the ammonium sulfate, in bulk or in 100-pound bags, leaves Port Adams by truck, box car, barge or deep-draft vessel.

Indeed, petroleum does provide agriculture with more than fuels and lubricants.

Application of anhydrous ammonia in conjunction with seeding wheat in the Oklahoma Panhandle.

Ammonia compressors at Phillips Chemical Co. Cactus plant, Etter, Texas.



Promoting Safety On a Big Construction Job

By Alan McCone*

SAFETY was "fun" on Catalytic Construction Company's $22,500,000 refinery project at Sun Oil Company's plant in Toledo, Ohio. That does not mean that the serious aspects of safety have been treated lightly, for the accident record is evidence of an effective campaign. In more than two million manhours there was not a single permanent injury; this means that not even a part of a finger was lost, and the incidence of lost-time injuries was only one-half of the national average.

Although the safety program of the company is a function of the industrial relations department, top management is intimately concerned with its policies. Management believes safety to be one of the most important factors in job costs. They state, "The largest variable in most construction projects is productivity of labor. Disregarding the real and hidden costs of accidents themselves, they seriously affect work efficiency. Nothing knocks down the morale on a job, and consequently affects production, more than frequent accidents. Also many of the best workmen in a community will refuse to work on a project that is experiencing frequent accidents."

Management feels a poor safety record reflects on the company's reputation in many quarters, which can affect the company's business and earnings. Customers, especially those in such hazardous industries as oil refining, will avoid contractors with poor safety records. Other contractors avoid association with unsafe operators because of the danger to their own personnel and the undermining of their own safety policies.

A much more concrete reason for the job safety is insurance costs. The difference between a good accident history and a poor one may represent enough difference in cost of workmen's compensation to be the difference between winning or losing a contract. All these factors weighed heavily with Catalytic's management in establishing the program for Sun's Toledo project.

Safety is a deadly serious business, but deadly seriousness as an attitude in the treatment of it becomes tiresome and safety requires alertness every minute.

The spirit which prevails in any group, activity has a marked effect on the results obtained and the satisfaction derived from it. Work in some plants is dull routine, and the quitting whistle is the awaited release from

*Manager of Industrial Relations, Catalytic Construction Co.

Meeting of safety inspectors under chairmanship of Art Bronson.

that dullness. The same work in another plant is effortless and production is a challenging game. Some parties are fun; at others you count the hours lost from sleep.

The success of the safety work on the construction of the Sun refinery was due more to a personality factor than to any organization or routine. Catalytic's safety engineer, A. A. Bronson, administered the program with such friendliness and good humor that complete cooperation was won from the work force of 1,500 men. No disciplinary action was necessary to enforce a safety rule in the entire course of the job.

By the nature of the project all of the intrinsic hazards of heavy industrial construction were present. Plant units were erected in a relatively limited area. The main unit, a Houdriflow catalytic cracker, is the tallest refinery structure in the world, exceeding 300 feet in height. Construction schedules made it necessary for installation to be made at lower levels while steel and equipment were being set above. On the ground 150 pieces of motorized equipment and the workmen on foot created the traffic problems of a busy city intersection.

At the outset the job was estimated to require two and a half million manhours. Examination of current figures for this type of construction, as reported by the National Safety Council, indicated that 63 men should experience lost time accidents. These accidents would result in more than 6,000 lost working days, if the experience on this project matched current averages. In this list of accidents there were potentially two fatalities.

The possibilities of such a record were discussed with representatives of the Toledo Building and Construction Trades Council who furnished the majority of the men for the work. Out of this discussion came an agreement for cooperation in a plan to reduce this accident potential. The Catalytic Construction Company agreed to furnish all the facilities, material and personnel necessary for an all-out safety program. Local labor representatives agreed that responsible men in their crafts would be assigned to serve as safety committeemen with the full support of the local union.

A. A. Bronson, who has had many years' experience as a manufacturer and general contractor, was appointed safety engineer. Mr. Bronson had not previously worked in such a capacity, but his familiarity with the general conditions amply qualified him for the responsibilities. The committee representatives from the various crafts were supplied with distinguishing safety inspector badges, so that they could be recognized and respected on the job. The safety rules of the company which covered all crafts were distributed to each committeeman. It was emphasized that for effective cooperation between the various crafts in matters of safety, committee representatives should be familiar with the hazardous aspects of not only their own work but that of other mechanics on the job. The management arranged that a weekly safety meeting should be held and that all committeemen were to be relieved of field responsibilities in order to attend. The company each week sent from the main office appropriate items on safety matters addressed to the homes of the committeemen. Safety posters were used extensively throughout the area. This material stimulated a safety consciousness among the inspectors, most of whom were assuming such duties for the first time. There is nothing exceptional in this type of safety organization, and in itself it gave no assurance of success. Success depended on sincere and constant safety thinking by every committee member, and his ability to carry the idea to every man in his group. This meant the reporting of infractions of rules without regard to personalities. It meant criticism of another craft's operations and the acceptance of such criticism. In severe cases it meant recommending discipline for a fellow worker. These are usually man-

Excerpts from Minutes of Safety Meeting Held Oct. 5, 1949

Minutes of previous meeting were reviewed and accepted by the committee.

Our usual Wednesday morning poster was delivered to each member early, announcing the opening game of the World Series and the 1:30 p.m. safety meeting. Bets were placed, gripes and complaints turned in and the meeting was on its way. The battery for the meeting was Joe Barbara and Frank Whalen. Frank pitched complaints to Joe Barbara about the rod busters not using a signal man when backing up with a load of reinforcing steel, and Joe caught them all and threw something back at Frank that Jim Barker would censor if it appeared in the minutes.

Item #131—Harold Hauter, the zero man on the accident summary chart, wants the deep holes filled or guard rails installed just south of the HCC tower.

Comments—Walt Woelke said that his men had already started to backfill and all holes would be completely filled by Thursday noon. In the meantime, there was no traffic through this area.

Frank Whalen said the cement finishers are skinning a lot of knuckles on the firewall and asked for a good supply of band-aids to protect their hands and fingers. Kelly asked Frank why they don't cover their hands with gloves instead of band-aids. "Twould be cheaper with more complete coverage."

Item #132—Frank Whalen says that many of the concrete trucks are taking too much of a chance when backing right up to the very edge of the ditch to pour the firewall. A cave-in of the bank would cause the truck to turn over into the ditch with fatal results.

Comments—The spotters for these trucks are selected by the foreman on the job. We have warned them to instruct the spotters that more caution is necessary on this job.

McCreary made a definite promise at this meeting that all hard hat signs would be posted Thursday. He is also one of the boys that is checking to see where scaffold planks are being diverted to other uses than for scaffolding. Mr. Barker, at our last Beef and Gripe meeting, made it very plain about the use of these special boards. They are specially selected, thoroughly tested, corners cut, ends painted red and stenciled which quickly identifies them for use on scaffolds only.

Mr. Barker stated further that many of these planks had been used for shoring and cribbing, which impaired their strength to the extent that they might be unsafe for use on scaffolds. The same persons who caused the misuse of these planks might meet their Maker later on when using them on the high tower, if they are not carefully collected and condemned for further use on tower, which we are doing as of last Friday.

Item #134—Paul Cothrel brought up a question of safety in connection with the use of a ⅝-inch choker for handling heavy pipe. Tiny with his side lift crawler, was passing Paul's lumber office with an 18-inch pipe about 50 feet long suspended by a ⅝-inch choker from the boom. Paul said it did not look safe and a larger choker should have been used.

Comments — Rus Crawford said the pipe gang was at fault because they loaded the job, and Tiny figured it was all right and started away with it, but if Tiny thought the choker too light for the job and an argument ensued, he could "dog it off" and wait for further developments. Joe Graffeo, who has handled everything from erector sets to 100-ton towers, was asked to express his opinion in this argument. Joe agreed with Paul that a ⅝-inch choker was too light for this job and that a spreader should have been used. Joe also emphasized that an experienced operator would refuse to tackle a load if too small a choker was used, or his piece of equipment was too light to handle it.

Item #135—Blain Grant says the stairway north of Berry Avenue leading to spheroids was never built for safety and recommends that it be repaired or wrecked.

Comments — Earl Fling, whom everybody likes around here, says this stairway was built for a gang of boilermakers who were stranded in the mud and could not get out until the stairway was built. They had been in there for a couple of days and expected to collect overtime, so Earl said they had this temporary stairway made to stop the expense. It has been in service over a year now.

Bill Kelly said he would see to it that this stairway was repaired at once. Don Armstrong said the old stairway had served a noble purpose in freeing these boilermakers, and he volunteered to help Bill do the job. Rus Crawford said it was only a nine inning job, and he would take his portable radio along and do what he could to help them.

We were interrupted at this point by the announcement that the score at the end of the fifth was nothing and nothing.

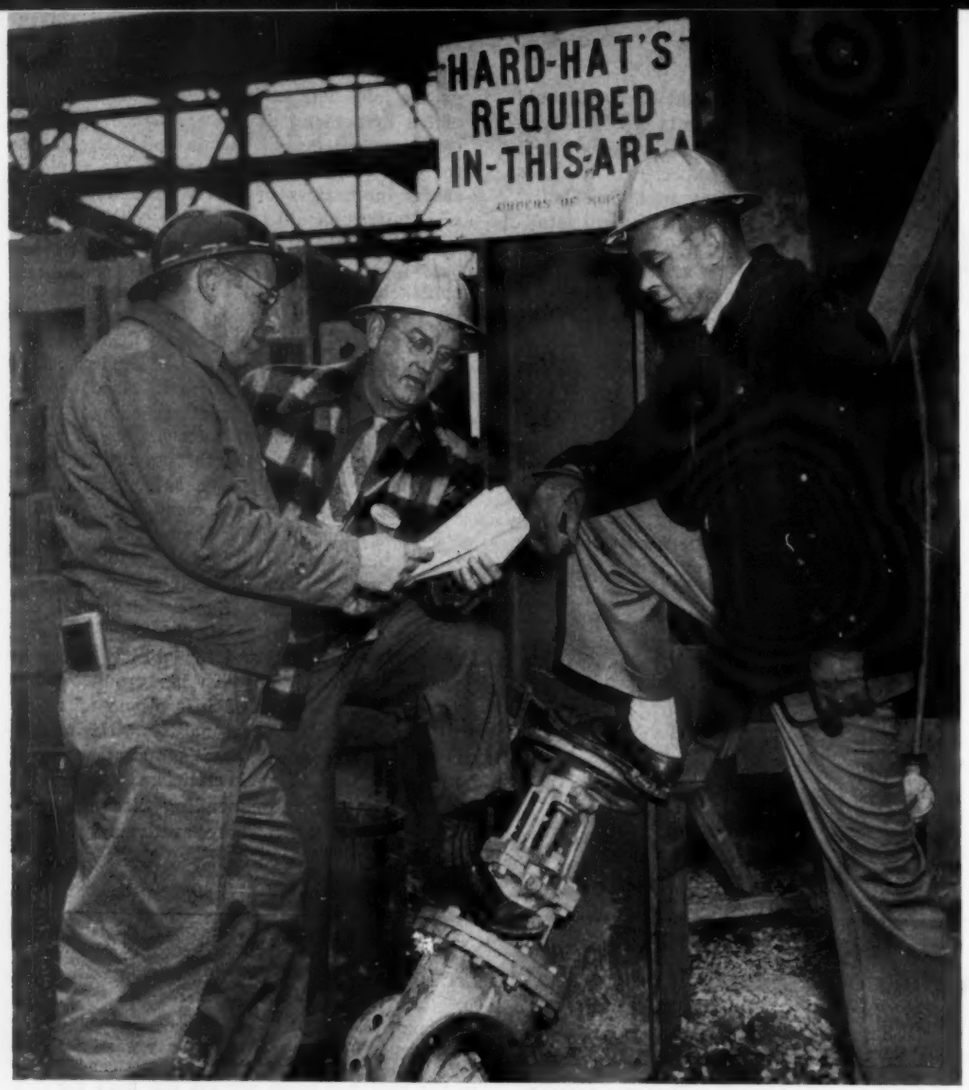
Item #136—Art Lang had a call from one of the guards, stating that a panel had been removed from No. 53 switch rack. Art said that no danger existed in this 2300-volt cubicle closed assembly unless someone deliberately removed the panels.

Comments—Bill Kelly promptly announced that his carpenters had removed this panel, but since the little conference he had just held with them, he could assure us that we should have no more concern about the carpenters messing with panels or any gadgets connected with them.

What we like about Bill is, he can take it or give it and look you straight in the eye.

Item #137—Steve Suchore suggests that a sturdy set of guard rails be installed on stairways leading to time office, as winter weather would soon make them unsafe for the 3:50 p.m. stampede.

Comments—This railing, what was left of it, was removed last spring and we thought for good, but several requests have been made to have railing installed again. This will be looked into thoroughly before next meeting.



Left to right: Art Lang, general electrical foreman; Art Bronson, safety director; and James Barker, field superintendent.

agement functions and are generally avoided by the workingman.

The general job morale was aided by an unusual plan inaugurated by Catalytic Construction Company. A welfare fund was established with the revenue from concessions for the dozens of vending machines for various items scattered throughout the construction area. The use of the money was entirely at the disposal of the workmen, who were represented by a welfare committee. Injuries, sickness or other hardship cases among the work force were brought to the attention of the committee which voted a sum of money for the subject. Almost $2,000 was paid into this fund, and at the end of the job the workmen voted to give the $765.07 balance to the Toledo Society for Crippled Children. As evidenced by the final gift, the welfare fund created a kind of civic responsibility on the job. By bringing the needs of the injured to a committee of workmen for their help, the value of accident prevention was brought home sharply at every meeting.

Mr. Bronson brought a personality and understanding to the job that eliminated friction and promoted friendliness. Policing was practiced on the spot by all safety committeemen, regardless of the offending craft. Each committeeman made notes throughout the week of dangerous practices worth reporting and these were listed individually as items for discussion. When a satisfactory solution had been arrived at or the hazard abated, the item was marked closed. If the condition continued or recurred, the item was kept open for weekly consideration until a satisfactory solution was achieved. The meetings engendered a great deal of good-natured rivalry between the craft representatives, and the recordings of these meetings reflected the good humored approach which was being made to the problems at hand. The meetings, which became known as "Beef and Gripe Sessions," were reported as nearly as possible in the language used. When conditions were such that the work of one trade created a constant hazard to another trade in the same area, there developed the makings of a feud. Mr. Bronson joked away the unpleasant features of the controversy and fostered a union of the groups so that they cooperated to eliminate the dangers. With personal tension relieved, the recordings of these feuds made as amusing reading to the rivals as to others concerned with the program. Cartoons and job gossip usually brightened the safety meeting reports, and when current events claimed a part of the men's interest, these too were reflected in the reports. The meeting which occurred during the world series was written up largely in baseball terms, which made the reading much less dull than the usual solemn material on safety subjects.

A solemn note was struck in the minutes of the meeting which followed the only near-fatal accident. A 2½ pound wrench fell off the tail structure and hit a workman on his safety helmet. There is no question that this blow would have crushed an unprotected skull. The weekly report contained an obituary which might have been used, had he not observed the safety hat rule. The story of his family's grief and financial difficulties was burlesqued, but the lesson was effective for safety consciousness.

The result of this treatment of safety subjects was that the job was fun, the meetings well attended, and the necessary business accomplished with minimum disagreement. Since the men were the natural leaders of their groups, their attitude was reflected in the field. The results proved the plan to be effective.

Final figures for the project showed 2,175,000 manhours worked in more than a year by as many as 1,500 men. There were 28 lost-time accidents, whereas national averages would indicate that 52 might have occurred. An indication that many of these accidents were of a very minor nature is that only 509 days were lost, compared to an expected figure of 6,300, indicated by the severity records of the National Safety Council on construction work. The National Index for lost-time accidents based on the number of injuries in one million manhours in the heavy construction industry is 23.8 whereas Catalytic's record on the Sun job was 12.9. The severity of injuries is measured by the number of lost time days in 1,000 manhours. The national average for construction is 2.9, but Catalytic Construction Company experienced only 0.23. There were, of course, no fatalities, when as stated earlier, two or more may have been expected.

The dispensary treated 3,617 injuries which did not result in lost time. Mrs. Esther Preece, a local registered nurse, administered to the minor ailments in a manner as friendly as it was efficient. The amount of malingering which may have resulted from the charming atmosphere of first aid was definitely offset by the general use of its facilities. The company policy that even the most simple injury has to be treated by first aid unquestionably reduced the amount of lost time which results from neglect of simple injuries.

The dollar value of such an active safety campaign is difficult to measure exactly. An important factor was the part the program played in keeping the project on schedule. In addition to the many other indirect economies, there was the very substantial direct one in the reduction of workmen's compensation rate from $3.64 per hundred dollars of payroll to $0.78.

Governor Frank J. Lausche of Ohio, whose state underwrites workmen's compensation, praised the performance in the following message: "We express to you our congratulations on your splendid record of performance and safety in the construction of the Sun Oil refinery at Toledo." Alan T. Knight, Catalytic vice president, in acknowledging this compliment, said: "Making a safety program work is the same problem as getting maximum production from your work force; you have to get the men on your team so they have a personal pride in the job."

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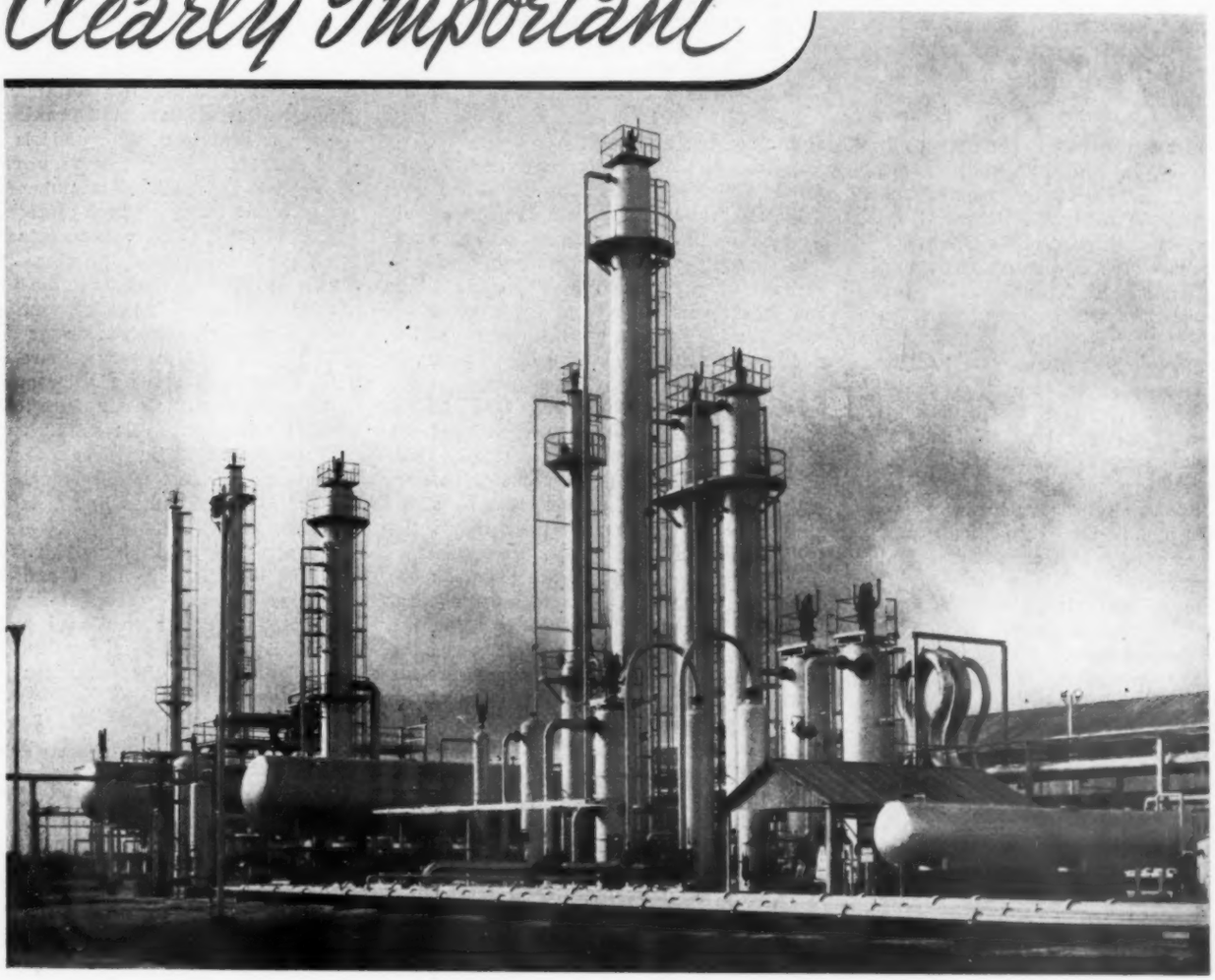

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Process Heating in Oil Refineries

ACCORDING to L. D. Stewart of the Mid-Continent Petroleum Company, waste heat recovery, by definition, is self-explanatory in that it is the utilization of heat that would otherwise be wasted. A prevalent, but out-dated notion is that the refinery power-process balance is of secondary consideration and that a full-scale study is not often justified in an already designed and operating refinery. Such an attitude will undoubtedly reflect in higher production costs.

A simple list of methods of recovering waste heat, whether it be in initial design or in proposed operation changes, might be as follows:

(1) Use of low pressure steam for heating or process where possible, in existing equipment.

(2) Increase the operating efficiency of furnaces and heaters by keeping the excess air to an operating minimum.

(3) Install economical heat exchange to save cooling water and fuel between oil streams, and with waste heat boilers, utilizing hot oil or flue gases.

(4) Utilize exhaust steam, with the addition of new equipment, as (a) superheat, and use for process as in oil strippers; (b) use for power drives, as in low-pressure turbines; (c) use for refrigeration, in either of three methods; (d) heat boiler feed water, as with steam exhausting from pumps, non-condensing or even low pressure turbines; and (e) condense the exhaust steam and return to condensate.

(5) Re-route water streams; use cold boiler feed water in plant condensers and coolers, where practical; route semi-heated cooling water from one unit effluent to another unit, before returning it to the cooling tower.

(6) Miscellaneous and future developments are as follows: (a) determine the economical relation between the amount of steam and vacuum to use in a vacuum unit; (b) establish optimum thickness of insulation; (c) install properly designed steam traps on steam heaters, which will discharge only a steam-free condensate; and (d) develop centrifugal compressors to handle economically vapors at high discharge pressures, to avoid condensing and liquid pumping when transferring to another heated process.

The pertinence of Item 1 is self evident.

As regards Item 2—increased furnace efficiency—it is shown that in a 50-million Btu per hour furnace, a reduction of excess air from 75 down to 32 percent will save Btu's worth $9.52 per day or $3,332 per year and more, if proper adjustments of burner and draft are made.

As regards heat exchange between oil streams, the net saving is the value of the heat saved and the cost of the equipment and its operation. To obtain the optimum saving, an appropriate design must be made. This design must equate surface of the exchange area, Btu's exchanged, and the mean temperature difference transfer rate. This condition can easily get out of bounds where temperature levels are low and the amount of heat to be transferred is great. A 6.4 million Btu per hour exchanger of suitable design to produce a 30° rise in the cooling water, where the mean temperature difference is 92°, could pay out in 240 days.

Waste-heat steam boilers using hot oil streams and other hot moving materials are well understood. Here the saving will be realized by a comparison of water cooling and steam generation, where the operation could be done either way when the cost of the cooling surface is about equal. However, if the steam-generating route is used in a cat plant charging 15,000 barrels daily, 74,000 pounds per hour of steam are produced for necessary use in the plant that, if taken from the power house, would cost $355.20 a day.

Various refinery processes require stripping steam, which usually ends up in the sewer line; in such cases exhaust steam should be used. However, since steam is more expensive than fuels, it is more economical to use a direct-fired superheater, as in the Petro-Chem Iso-Flow system. In any case the expansion of live steam to a low pressure for process operations without making use of the available work should be avoided.

A thermodynamic principle is that the efficiency of any heat-power cycle is greatest when the temperature range of the cycle is broadest. Reciprocating engines use more of the steam's energy at high than at low pressure, but turbines have an advantage at low pressure, since they operate on a complete expansion cycle. Heat may thus be saved by installing low-pressure turbines for pumping. In general, wherever exhaust steam is expanding to the atmosphere at any pressure above zero, it should be directed to an exhaust steam turbine, preferably condensing.

In the matter of refrigeration, the tendency of refiners is to "grab" a gas engine compressor because it is convenient, but the absorption refrigerator system deserves more attention than it is getting, because it is easily adapted to the use of exhaust steam for low temperature cooling. With this system using 250°F exhaust steam and at an evaporation temperature of 30°F, a work ratio of 50 percent may be obtained on a straight absorption system, which represents a considerable advantage over mechanical refrigeration, and the outfit costs 30 percent less. A refrigeration authority has stated that most refiners could obtain their entire refrigeration from waste heat, but only about 10 percent of this large group have taken advantage of the fact.

Boiler feed-water heating with exhaust steam above zero psi, is common practice. Since the use of exhaust steam turbines for boiler feed-water pumping is a "natural" in the same unit area as the feed-water heating, consideration should be given to the use of the exhaust steam from the low pressure turbines for this service. This latter procedure could only be used, of course, when the boiler feed-water temperature is below that of the exhaust steam under vacuum.

Some water streams could bear re-routing. The two main heating requirements in refinery processing are: to do work and to raise the temperature of the materials being processed. Most of the first requirement is accomplished through the medium of steam, and the second by direct heat contact. The heat absorbed by raising temperature must be removed again in cooling water. Ideally then, why not transfer the heat in the cooling water directly into the boiler by routing the feed water through plant condensers and coolers? Thus heat used for temperature raising will be transferred over to heat required for doing work rather than wasted to the atmosphere. The prime cost of this type of waste heat recovery is in piping rather than heat exchange surface, so a reasonable payout is easily obtained unless line distances are excessive.

Summarizing his study, Mr. Stewart explains that if only one of each of his calculated examples were capitalized, excluding most of the items mentioned such as waste heat boilers and refrigeration, the saving could amount to the following:

One furnace efficiency improved	$ 9.52 per day
One heat exchanger installed	22.90 " "
One shell and tube steam superheater installed	8.58 " "
One exhaust steam turbine installed, 200 hp, 40.0 steam rate	38.40 " "
Saving from proper steam traps	10.00 " "
Total saving = $32,631.00 per year	$89.40 per day

Total savings of the full program could amount to three times that much, or to 10 percent of a million-dollar fuel bill.

The dictum that heat should be saved is another way of saying that it should not be allowed to go to waste. This other side of the matter, relating to oil-heating furnaces in refineries, was aptly treated by Robert D. Reed of the John Zink Company, whose subject was "A New Approach to Design for Radiant Heat Transfer in Process Work." Mr. Reed points to another factor that apparently has not been sufficiently regarded in furnace design.

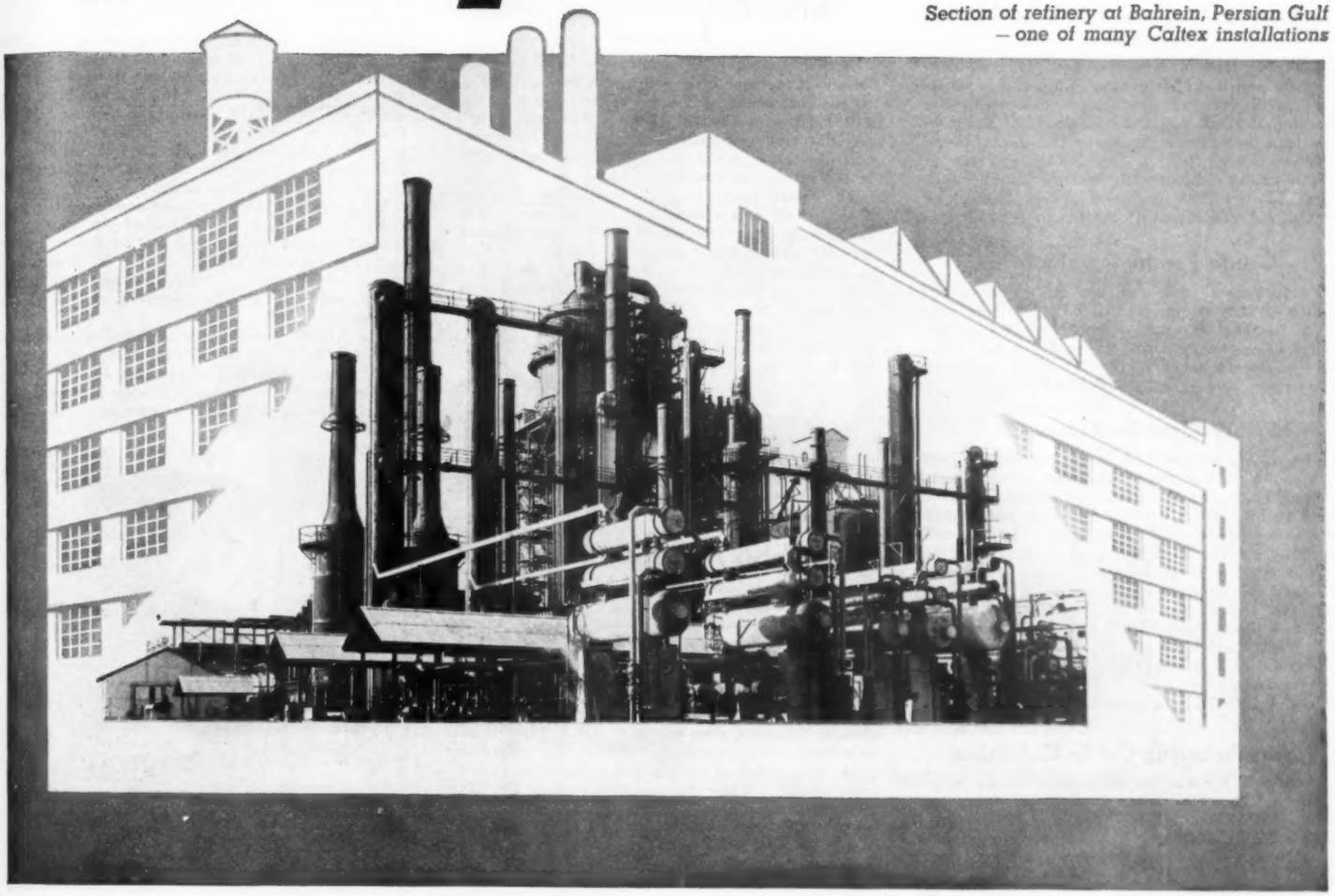
The heat that is generated in an oil-heating furnace consists of radiation from the flame-bursts of the burners, heat that is radiated from the hot refractory planes of the furnace lining and radiation from the hot gases that are moving away from the burners. The design engineers have convenient factors for calculating the radiant energy of these sources. These factors sum up to the result that about 54.31 percent of the heat of the fuel is available in the form of radiation.

(Please turn to page 68)

* This article is a summary of three papers presented at a symposium held at Tulsa, June — under the auspices of the John Zink Company.

Oil is *power*...

Section of refinery at Bahrein, Persian Gulf — one of many Caltex installations



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International news and notes

Robson Made Head Wrightson Director

Selby T. Robson, who has been London manager for the Head Wrightson group of companies for nearly twenty years, has been appointed a director of Head Wrightson & Co. Ltd. Mr. Robson is a well-known figure in the international industrial field, having traveled extensively in behalf of his company. He was one of the founders and the first chairman of the Council of British Manufacturers of Petroleum Equipment.

Crude Production In Iran

Production of crude oil in Iran during the month of May is reported as 2,771,000 long tons or at the rate of approximately 670,000 barrels daily. For the five months from January 1 to May 31, production was 13,053,000 long tons, an average of roundly 648,000 barrels per day.

Wildcat in Assam

The Assam Oil Co. Ltd. is drilling below 5,300 feet on its wildcat test at Barsilla in the Assam jungle. Last year the same rig drilled a test in the Tiru hills which proved to be dry. Settlement of the Bengal-Assam frontier dispute is expected to stimulate the search for oil in this area to supplement the production at Dibgoi. Much preliminary survey work has been going on in East Pakistan. In northern Pakistan Attock Oil Co. has been producing oil for more than 30 years in the West Punjab. Last year Burmah Oil Co. (Pakistan Concessions) Ltd. drilled a deep dry hole at Lakhra in the Sind desert. A successful well was drilled in the Chakwal area a year ago.

New Marketing Co. In Colombia

Preparing for the discontinuance of its operations in Colombia on the expiration of the De Mares concession in 1951, Tropical Oil Company will transfer its marketing facilities to a new company to be known as Esso Colombiana S.A. Like Tropical, the new company will be a subsidiary of International Petroleum Co. Ltd., which itself is a member of the Jersey Standard group.

L. A. Nomads Entertain Visitors

Foreign guests in attendance at the Nomads' Los Angeles Chapter monthly meeting on June 14 are shown in the accompanying illustration. Seated, left to right: R. E. Lorenz, Iraq Petroleum Co., John E. Sligh, Iraq Petroleum Co.; E. N. Mitchell, Philippine Oil Development Co.; Eugene L. Davis, Arctic Contractors; C. E. Bickerdike, Wm. Kenyon & Sons Ltd. Standing, left to right: Walt L. Sears, Iraq Petroleum Co.; Karl L. VonderAhe, Arctic Contractors; L. E. Miles, Iraq Petroleum Corp.; David L. Cantway, Mene Grande Oil Co., and J. D. Bryan supervisor pipe service.

Foreign Guests at Nomads Meeting

British Columbia Grants Price Increase

British Columbia oil companies have been allowed an increase of a cent and a half per gallon in gasoline prices on recommendation of the Coal and Petroleum Control Board. Wholesalers will pay one cent per gallon more, but the consumer will pay the cent and a half, the extra half going to the service station operators.

The board made its recommendation after the books of all companies had been thoroughly examined by chartered accountants. The finding for the increase was made in view of the fact that earning power of the companies had decreased considerably due to rises in administrative costs and wage increases.

The current increase is regarded as a step toward the final removal of price control, which has been abandoned by other Canadian provinces except Nova Scotia. Spokesmen for oil companies in British Columbia have said repeatedly that they are not interested in providing the needed increase in refinery facilities as long as they are hampered by control regulations.

The latest increase brings the price of regular gas in Vancouver up to 37 cents an imperial gallon and premium up to 39.

Italy's Newest Oil Field

For a while after the AGIP discovered the Cortemaggiore (Piacenza) field in July 1949, popular enthusiasm was at fever heat. Optimists hailed the discovery as a promise that Italy would now be able to cover her oil needs. More than 800 applications for exploration concessions poured into Rome from foreign and domestic capitalists. Among the applicants were the Italian hydroelectric interests, who saw a threat to their business from cheap petroleum fuel.

In the succeeding months the enthusiasm waned considerably. While the discovery is a notable one from the national standpoint, it cannot as yet be regarded as solving Italy's oil problem, and it is now seen that the field's development will require much work and a large amount of capital.

The structure, which was located by geophysical methods, appears to be a south-north plunging anticline with a slope of about 12 percent and is estimated as having a length of eight or more miles and a width of 2.48 miles. From the exploratory work done up to the present it appears that throughout its whole extent the structure contains two pay zones—an upper gas zone which is estimated to contain a natural gas reserve of 35.3 billion cubic feet, and a lower oil zone. These two zones are separated by a layer of hard rock 1,968 feet thick. The discovery well No. 1 was drilled at the southern extremity of the structure and reached the floor of the gas zone at 3,936 feet and the oil zone at 5,904 feet.

Five miles farther north, well No. 4 has penetrated through the gas zone to a depth of 6,232 feet, but has not yet reached the oil zone; the expectation is that here oil will be found at 8,200 feet, a depth to which Italian drilling rigs are hardly capable of reaching.

Well No. 6, located at about the middle of the field, is being sunk by an American drilling crew and a rig capable of reaching a depth of 14,760 feet. This well is expected to attain the gas zone at 4,920-5,576 feet and oil at 7,216-7,544 feet. The geophysicists have an idea that more oil should be found further down.

With the six wells now completed, another four (two of which are in charge of American personnel) are under way, and another five will be so by April, making a total of 15. It is expected that these 15 wells will confirm the exact extent of this reservoir and the reserves of oil and gas it contains.

The AGIP, which controls the Cortemaggiore field, also controls others in the region of Caviage and Ripalta (Lodi). The planned system of gas pipelines in the Po valley will soon be completed, and new lines are under construction.

Sir George Legh-Jones

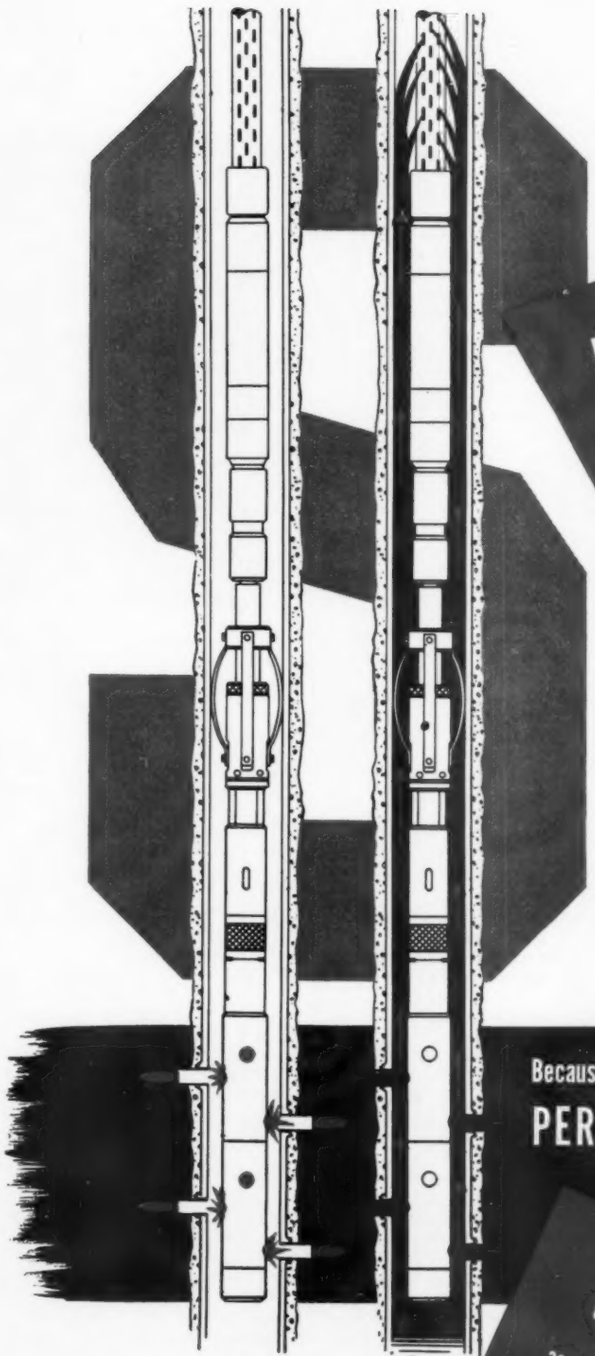
GEORGE LEGH-JONES, chairman of the board of Shell Caribbean Petroleum Co. and Shell Oil Co. and managing director of the Royal Dutch Shell Group of Companies, has received the signal honor of Knighthood, as announced in the British Honors List published on the occasion of the official birthday of the King of England in June.

Barges for Brazil

A fleet of three small barges especially designed for short-distance transportation of gasoline are being placed in service by Cia. Brasileira de Petroleo Gulf to supply customers in the Rio de Janeiro area. The all-welded steel barges, constructed and launched at the Pittsburgh shipyard of Dravo Corp., were towed to New Orleans and loaded on the deck of a Delta Line ship for the ocean trip to Rio.

Only 77.5 feet long, the little vessels can carry approximately 1,250 barrels of gasoline with a draft of about six feet. They will operate in Guanabara Bay between Brazil-Gulf's bulk storage terminal on Pancaraiba Island and the company's new distribution terminal just outside the city limits of Rio. In addition they will be used for deliveries to Gulf customers with shore receiving facilities.

The eight-mile shuttle trip from island to mainland is necessitated by Brazilian government limitations on the amount of gasoline which can be stored on the mainland. Gulf's new distribution terminal is located on property assigned by the government for this purpose in the Caju district of Rio. Previously shuttle barges from the island bulk storage depot had to discharge directly into tank cars or tank trucks at Rio's city docks.



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Following perforation formation fluid enters Johnston Tester Assembly.

Saudi Arabian Production

Crude oil production in Saudi Arabia during May amounted to 17,078,238 barrels or an average of 550,911 barrels per calendar day, it is announced by the Arabian American Oil Co. Crude processed at the company's refinery at Ras Tanura amounted to 2,327,112 barrels, an average of 75,068 barrels a day. Crude oil production for the first five months of 1950 amounted to 71,652,396 barrels, an average of 474,519 barrels a day. Crude run in the refinery for the same period was 12,968,474 barrels, and average of 85,884 barrels per calendar day.

Discovery in Peace River District

A recent discovery by British American Oil Co. and Shell Oil Co. of Canada in the Peace River district of Canada, near the British Columbia border, is kindling additional interest in this area. The new well, the British American-Shell Whitelaw No. 1, is only 60 miles from the border and may influence the construction of the proposed natural gas line through British Columbia to the Pacific Coast.

J. Gerald Godsoe of Toronto, vice president of British American Oil Co., said in a visit to Vancouver that the well ranks among Alberta's biggest gas producers and is also an important oil discovery.

Joseph Coates to Retire

Joseph Coates, senior geologist of the Burmah Oil Co., has returned from India to the United Kingdom preparatory to retirement after more than 25 years with the BOC. Recently he has been engaged largely in a supervisory capacity on the oil exploration work which was started in 1939 in India and Burma. His headquarters for the past one and a half years has been in New Delhi.

Mr. Coates joined the BOC geological staff in 1923. The early part of his career was spent in geological mapping and on oil field development problems in widely separated areas of the subcontinent and in Burma. One of his special assignments in those days was the detailed mapping of the oil field areas of Burma. Another was the start of the BOC systematic work on the correlation of the Assam tertiary rocks by means of heavy minerals study—a method which proved fruitful and has since become a standard technique.

From 1929 to 1938 he was occupied almost entirely on oil field development in Burma where, among other tasks, he carried out many separate investigations into newly developed scientific techniques, such as gas injection. In 1935 he visited the United States to study the latest practices of gas injection and controlled directional drilling of oil wells.

After the "denial" of the Burma oil fields in 1942, by which the invading Japanese armies were prevented from operating the oil industry for their war machine, Mr. Coates returned to India in 1942 as senior geologist.

Joseph Coates

Aramco to Operate in Sterling

It was announced on July 7 that negotiations between the British government and the Arabian American Oil Co. had opened the way for Aramco to utilize sterling in some of its overseas transactions. The announcement stated that the oil company had been aided in its discussions by the United States Department of State. Companies which market Aramco oil are making arrangements to pay Aramco in sterling and other currencies. The talks with the British were for the purpose of adjusting exchange restrictions so that sterling received from the marketing companies could be used by Aramco for purchases of materials needed in Saudi Arabia and in royalty payments to the Saudi Arabian government.

As a result of the talks in London, Aramco expects its production in Saudi Arabia to average about 490,000 barrels per day for the year 1950. It had been expected that the average during the year would amount to less than that figure, but utilization of sterling would enable Aramco's affiliated companies to retain markets which otherwise might have been lost.

The report to the Saudi Arab government of the Arabian American Oil Company for the year 1949 gives crude oil production as 22,820,733 tons or an average of 477,000 barrels daily. Production reached its peak in February of last year. Since then it has been declining. The decrease is attributed to regulations established by British exchange control which prevented American companies from selling their oil for sterling until the recent agreement was negotiated.

During the year two new fields were discovered at Ain Haradh, where three wells were completed at depths around 6,500 feet, and at Al Fadhili, where one was finished at 10,675 feet. Altogether 24 wells were completed and five rigs were drilling at the end of the year. Geological field parties and geophysical crews carried on exploratory surveys along the eastern coast of the peninsula and further south beyond Qatar. Seismographic land surveys were made in the Jauf region and along the coast. A marine seismographic party is working in the Persian Gulf off Ras Tanura.

Average daily charge to the refinery at Ras Hanura was 126,766 barrels, producing gasoline, kerosene, diesel oil and fuel oil. The report notes that the distribution of petroleum products in Saudi Arabia has increased steadily during the year.

Of the company's more than 5,000 employees, by far the greater part are Saudi Arabs, 3,378. Next in order are the Americans, 947, with the remainder made up of various mid-eastern nationalities.

A noteworthy feature of the report is the attention devoted to the provision of housing for employees and the training in accident prevention. Through the industrial development department, industrial training is given to many natives, fitting them for skilled jobs or enabling them to work as independent artisans.

Cooperation with the government in agricultural and transportation improvements is the chief non-oil activity of the company.

June crude production in Saudi Arabia averaged 562,640 barrels daily as compared with 550,991 barrels daily in May and an average for the first half year of 489,114 barrels daily. June production was the highest which has been reached thus far in Saudi Arabia. The 1949 peak was 532,282 daily in February. Average for the year was 476,736 barrels daily.

Complete North Africa Survey

Flying of North Africa's first airborne magnetometer survey has been completed by Aero Service Corp. of Philadelphia. Approximately 20,000 square kilometers in north-central Tunisia were flown to begin Gulf Exploration Company's exploration program in the area. Magnetic mapping of the area was done in less than 30 days with the new, improved, high sensitivity Gulf airborne magnetometer. A record accurate to variations as small as one gamma was obtained. The data will be compiled in magnetic intensity maps at a five gamma contour interval. Aerial photographs made during the course of the survey will also be studied stereoscopically.

Dredge for Venezuela

Creole Petroleum Corp. has accepted delivery of a 2,000-hp diesel-electric suction dredger for use in its Venezuelan operations. The craft was designed by the marine department of Standard Oil Co. (N.J.) and built by Canadian Vickers, Ltd., Montreal. Overall length of the dredge is 250 feet, breadth 46 feet, maximum draft 15 feet. The dredge is fitted with hoppers with a capacity of 1,076 cubic yards, so that it can operate as a single unit. In dredging trials hoppers were filled in 30 minutes. Loaded trial speed was 11 knots.

W. J. Connelly

W. J. Connelly Retires

W. J. Connelly, a member of Creole Petroleum Corporation's management committee for the past five years, retired August 1. He not only supervised the development of Creole's multimillion-dollar Amuay Bay project but also organized the company's refining department.

In March of this year Mr. Connelly completed 25 years in the oil industry, 22 of them in Latin America with affiliates of Standard Oil of New Jersey. He plans to take a short vacation and then go back to work, either in a consulting capacity or as partner in a small business. He is 55 years old.

Mr. Connelly began his career in the oil industry as a chemical engineer with the Standard Inspection Laboratory at Bayonne in 1925. In 1927 he became chief chemist at the Capana refinery of the Compania Nativa de Petroleo in Argentina. He later became manager of that refinery and subsequently president of the company, a position he left to come to Venezuela in 1945.

Gasoline Sales Rise Sharply

Scottish gasoline sales have jumped an approximate 17 percent since release from controls, according to C. Gambage, director and general manager of the S.M.T. Sales and Service Co. Ltd. Pleasure motoring has taken only a little extra; biggest demand has come from commercial travelers and industry. This section of the public campaigned unsuccessfully for more fuel for some time before the freeing. Commercial travelers are now among the heaviest buyers, Mr. Gambage says. There has been a boom in second-hand cars too.

Drilling in Peru

A report from Peru states that Empresa Petrolera Fiscal, government oil company, has signed a contract with Dunlap and Graham of Long Beach, Calif., for the drilling of deep tests of 7,500 to 9,000 feet in the Zorritos field in northern Peru. The wells are to explore the deeper horizons of that region, as production of the Miocene Zorritos formation is nearing exhaustion. Work has already started.

In the Organos field drilling has been undertaken in the hope of increasing production. The use of rotary equipment to reach deeper formations is under consideration.

write for Bulletin 0-49-7

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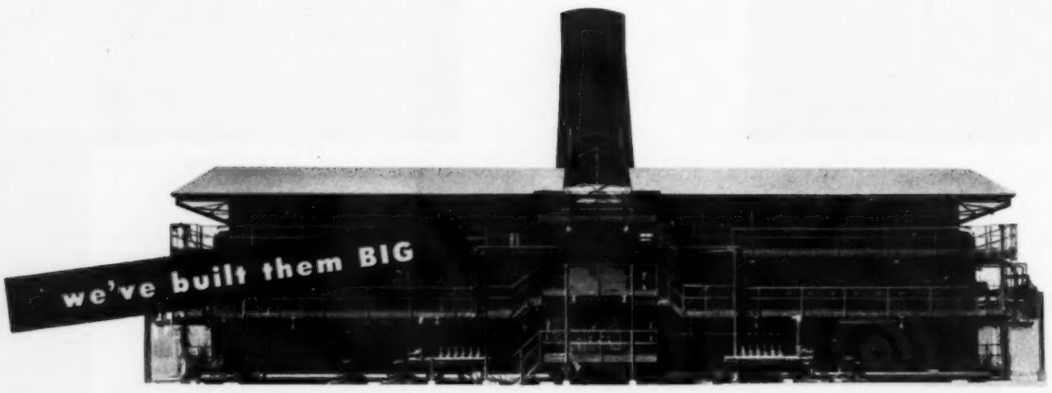

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Oil company staff changes

Dr. K. C. Heald

DR. K. C. HEALD, vice president of Gulf Oil Corp. and many of its subsidiaries, has been elected a director to succeed E. C. Bothwell. Mr. Bothwell retired July 1 after 35 years of continuous service with the company. Prior to joining Gulf, he had participated in the development of the Glenn Pool, Oklahoma's first great oil strike. A vice president for the past 15 years, he has been in charge of foreign and domestic exploration and production since 1946.

Dr. Heald resigned as associate professor of geology at Yale in 1925 to become chief staff geologist for the Gulf companies. In 1945 he was elected a vice president and in 1949 was made responsible for exploration and production activities in the United States and Canada. He now is in charge of all Gulf's exploration and production activities.

RAY W. SOMMER of Minneapolis, Minn., has been appointed manager of lubricating oil sales for the Kendall Refining Co., Bradford, Pa. He joined the Kendall sales organization after many years experience in oil selling. He was promoted to division sales manager in 1944 in Minnesota and adjacent states.

H. P. CALDWELL has been made supervisor of the refining section of the research and development laboratories, Socony-Vacuum Oil Co. Inc. Mr. Caldwell was employed by General Petroleum Corp., a Socony-Vacuum affiliate, in 1934, after receiving his B.S. degree in chemical engineering from Purdue. He has been in the Socony-Vacuum laboratories, Paulsboro, N. J., since 1936.

F. W. KRUG has been appointed manager of operations of Pan American Pipe Line Co., Houston. J. F. Chapman has been named general superintendent and W. H. Bruyere Jr., acting chief engineer. Milton Crow has been appointed district superintendent of the west Texas division with headquarters at Snyder.

J. C. RICHDALE, manager of the New England division of Esso Standard Oil Co., has been appointed assistant to the president with headquarters in Boston. Bernard F. Shea, presently assistant division manager, succeeds him as division manager. Mr. Richdale has been active in the petroleum industry since 1905. During the war he was liquid fuels administrator for Massachusetts and chairman of the New England Council Commission on liquid fuels. He was also a consultant on defense transportation and has served as chairman of the Petroleum Industries Committee.

H. ROSS BOLTON, formerly petroleum engineer for Ohio Oil Company's Terre Haute division, has been appointed chief engineer in Deep Rock Oil Corporation's production division. He succeeds K. W. Haley, resigned. Mr. Bolton began work as roustabout for Ohio Oil in California in 1938 following his graduation from the University of California.

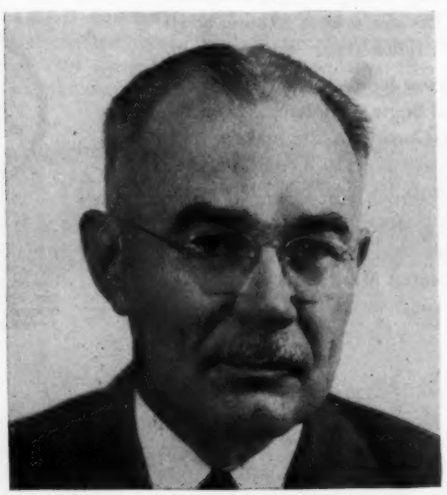
D. W. GOUGH has been appointed a member of the California management committee of Kern Oil Co. Ltd., Los Angeles. Mr. Gough has been serving the committee as executive assistant since his return to the company in 1946 following military duty. Other members are A. P. McEachern, chairman and California counsel and assistant secretary of the company; F. M. Ziegler, California production manager and managing director of Kern's associate company in the British West Indies, Kern Trinidad Oilfields Ltd.; and R. J. Stephens, general superintendent.

C. L. PARRIS has been appointed chief engineer of the technical department of Pan-Am Southern El Dorado (Ark.) refinery. Harry K. Wheeler is technical director. Mr. Parris will have supervision of the mechanical, civil and inspection engineers. He comes to Pan-Am from the engineering department of the Standard Oil Co. (Ind.) at Whiting, Ind.

WALTER R. C. MILLER, coordinator of the world-wide mechanical shop modernization program of the Standard Oil Co. (N.J.) retired July 1 after more than 30 years' service. He started as a draftsman with the Midwest Refining Co. in Wyoming in 1919 and was transferred to the Lago Oil and Transport Co. in 1928 and sent to Aruba, NWI. He was appointed mechanical superintendent of the Aruba refinery in 1936 and saw it grow to become the largest refinery in the world before he was transferred to the Standard Oil Development Co. in 1947.

J. A. CLEVERLEY of Bartlesville, Okla., has been appointed assistant general superintendent of the oil production division of Cities Service Oil Co. (Del.), according to an announcement by M. J. Kirwan, manager of the division. Mr. Cleverley joined Cities Service after service in the Navy in World War I. In 1924 he was assigned to the engineering department and later was advanced to district production superintendent in southern Kansas. In 1945 he was placed in charge of the Oklahoma City district until 1948, when he was transferred to Bartlesville.

J. A. Cleverley



Charles K. Gamble

CHARLES K. GAMBLE, a vice president and director of Standard-Vacuum Oil Co., has retired after nearly 35 years of international petroleum experience, it is announced by P. W. Parker, chairman of the board.

Mr. Gamble started in the oil industry in 1916 in marketing operations in Turkey, Syria and Greece. In 1927 he went to the Pacific area, where for the next 18 years he helped to develop petroleum markets in Australia, New Zealand and the South Pacific islands. In 1938 he became managing director and chairman of the board of Vacuum Oil Co. Pty. Ltd., Stanvac's Australian affiliate, which position he held until returning to New York in 1945.

Named a director of Standard-Vacuum in 1945 and a vice president the following year, Mr. Gamble has since supervised the company's interests in South Africa, Australia, New Zealand and the South Pacific islands, as well as the marketing of lubricants, special petroleum products, marine fuels and the purchase and distribution of all product requirements throughout Standard-Vacuum's entire area of operation.

FRANKLIN ROWLEY has been elected a director of Esso Export Corp. He has been assistant general purchasing agent of Esso Standard Oil Co. since 1940. His new duties will include the coordination of purchases of materials abroad. Mr. Rowley joined the Jersey Standard organization in 1920. Before becoming assistant general purchasing agent, he served as buyer for drilling and production equipment and as European coordinator of purchases.

JOHN W. PAYNE has been made technical director of the development division of the research and development laboratories, Socony-Vacuum Oil Co. Inc. Mr. Payne received his B.S. degree in chemical engineering from Yale in 1930 and has been associated with Socony-Vacuum since 1931.

REAR ADMIRAL THOMAS J. KELLY, U. S. Navy (ret.) has joined the Socony-Vacuum Oil Co. Inc. as an assistant to the chairman of the board. Admiral Kelly retired from the Navy after 33 years' service which included two wars and considerable active combat duty. He is a graduate petroleum engineer from the University of Pittsburgh and has done roustabout work in mid-continent fields.

FRITZ W. MARTIN has joined Loffland Brothers Co. at Tulsa to do contact work for the company in Oklahoma and Kansas. He has operated his own drilling tools in the past.

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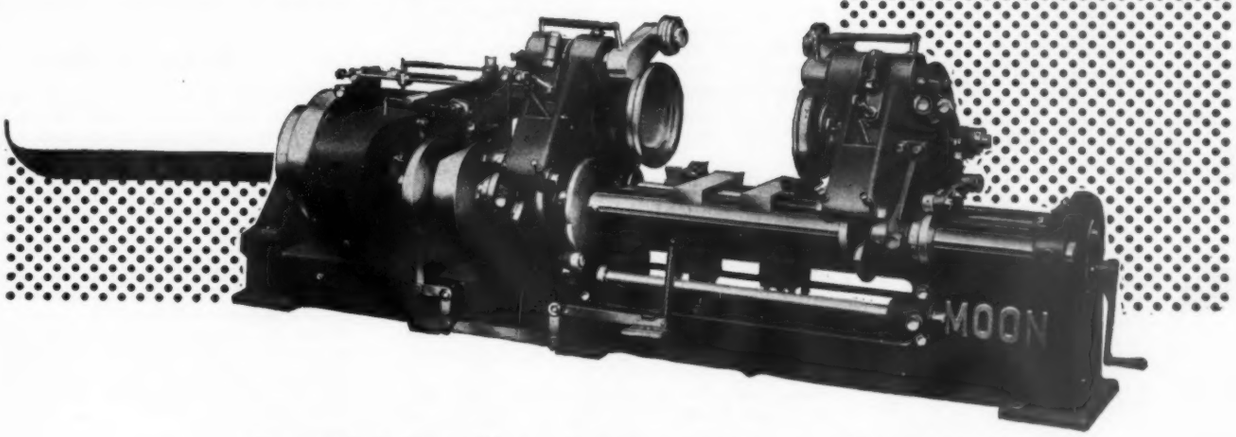

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Wilfred Tapper

Ralph Emery

W. D. Owsley

Grover Kilgore

New Executives for Halliburton

Several changes and promotions among executives of Halliburton Oil Well Cementing Co. were announced by Erle P. Halliburton, chairman of the board, following the annual directors meeting on June 29: Wallace R. (Mac) McClendon, who has been vice president in charge of field operations since 1942, became president. L. B. Meaders succeeds to the position formerly occupied by Mr. McClendon, and L. D. Campbell, vice president and secretary treasurer, was made a director.

Other vice presidents were named as follows: Ralph R. Emery in charge of foreign operations; Wilfred Tapper, director of electrical well services; W. D. Owsley, technical advisor to executive officers; and Grover Kilgore, sales and advertising. Retiring President John C. Halliburton, who has been associated with the company since 1932 and has been its executive head since 1947, plans to devote his time to ranching operations near Duncan, Oklahoma.

Ralph R. Emery, newly elected vice president in charge of foreign operations, began his Halliburton career in July 1927 as catcher on The Cementers, the Halliburton-sponsored semi-pro ball team of the 1920's and '30's. His first field assignment was at Conroe, Texas, in late 1927 as a cementer. He has served as division superintendent in the Rocky Mountains and in Kansas. He went to Halliburton's home office at Duncan in 1945 as safety engineer and later that year was named manager of foreign operations.

Wilfred Tapper, vice president in charge of electrical well services, joined Halliburton in 1939 after experience with both the Illinois and Iowa geological surveys. His first Halliburton job was as helper on electrical well services truck. Assignments as geologist followed but were interrupted by three years as commander of Navy minesweepers in the Atlantic, Pacific and Caribbean. Returning from naval service in 1945, he worked as electrical well services engineer at Tyler until January 1947, when he transferred to Duncan as manager of electrical well services.

William D. Owsley, vice president and technical advisor for executive officers, started with Halliburton in March 1932 in the shops and engineering department at Duncan. He held several engineering posts in the field and in 1942 became chief engineer for Halliburton's war products division; chief engineer of the company in 1943; and technical advisor in 1947.

Grover Kilgore, vice president in charge of sales and advertising, is a native of Duncan, Okla., where he began his Halliburton career in July 1926, soon after completing three years of study in geology at the University of Oklahoma. He first worked as swamper on a truck, then as a cementer and fieldman and salesman. He served as assistant superintendent of Oklahoma-north Texas division at Wichita Falls, Texas, for five years, and contact man, Gulf Coast area, with offices in Houston during 1946. Mr. Kilgore returned to the home office at Duncan in January 1947 as sales manager.

UOP Organizes Construction Subsidiary

David W. Harris, president of Universal Oil Products Co., has announced the organization of Procon, Incorporated, as a subsidiary of Universal. Officers of the new company will be: J. C. Raaen, president; C. B. Whyte, vice president and general manager; and C. J. Giuliani, secretary and treasurer.

Procon, Inc. has been organized to handle the construction of refinery specialty installations and particularly units for operating Universal's new Platforming process. Its president, Mr. Raaen, served with the Ordnance Department of the United States Army during World War II with the rank of Colonel. As executive officer to the chief of Ordnance, he was largely responsible for the building and operation of ordnance projects throughout the country. Following the war and until his retirement from the Army in September 1947, he was commanding officer of Watervliet Arsenal.

Field operations of Procon will be under the direction of C. B. Whyte, who has been identified with the refinery construction business for a number of years, as Mr. Whyte's broad experience included the position of chief engineer of the refinery division of the Arkansas Fuel Oil Co. and supervisor of construction of the Lake Charles, La., refinery of Cities Service. In 1946 Mr. Whyte joined Universal as chief construction engineer and since that time has supervised the construction of UOP processing units in the refineries of domestic and foreign companies.

Dr. Otto A. Beeck

Dr. Otto A. Beeck, an associate director of research at Shell Development Co. in Emeryville, Calif., died suddenly July 5 after a heart attack. Dr. Beeck joined Shell as a research physicist in 1933 and became head of the physics department in 1936 and an associate director in 1942. He had recently been invited to lecture before the Faraday Society in Great Britain.

Du Pont Aviation Consultant

John R. Griffin has joined the technical staff of the Du Pont petroleum chemicals division as aviation consultant. He will specialize principally in fuel and lubrication problems in aviation. He came to Du Pont from the Sharples Corp. where he was chief engineer of the research laboratory. His headquarters will be in Wilmington.

Col. Osborne Resigns

The Council of British Manufacturers of Petroleum Equipment has accepted the resignation as director of Col. A. S. Osborne. He left the association to take a position in industry.

DR. ROLSTON L. BOND, technical director of the butadiene division of Cities Service Refining Corp., Lake Charles, La., has been named assistant chairman of the chemistry and chemical engineering department at Armour Research Foundation of Illinois Institute of Technology. An expert in petroleum technology, Dr. Bond has been with Cities Service since 1943. He was a research chemist for the Tidewater Associated Oil Co. and the National Oil Products Co. from 1938 to 1943.

JAMES B. BLACK of San Francisco, president of Pacific Gas and Electric Co., was recently elected a director of Shell Oil Co. His election raises the number of Shell directors to 20 and introduces a business representative from the Pacific Coast to the board. Mr. Black has been vice president of Western Power Corp. and vice president of the North American Co. He became president of Pacific Gas and Electric in 1935.

Richard R. Shinn

Richard R. Shinn, 61, general superintendent of the production department of General Petroleum Corp., died June 18 in Los Angeles as a result of a traffic accident. Mr. Shinn joined General Petroleum in 1913 as a production foreman. He became general superintendent in 1946 after holding a number of supervisory posts in California fields.

WILLIAM C. CRAIG JR. will supervise the Standard Oil Co. (N.J.) documentary collection of photographs, following the recent resignation of Roy E. Stryker, who assembled the collection. Mr. Craig works on special assignments in the company's public relations department and will supervise the photographic library in addition to his present duties. Since the photographic collection was begun seven years ago, more than 50,000 photos portraying the industrial, scientific and human sides of the oil business have been taken.

Mr. Stryker is taking a position as director of a new photographic library at the University of Pittsburgh.

Rockwell Promotes Dixon

L. A. Dixon Jr. has been appointed assistant vice president of the Rockwell Manufacturing Company's meter and valve division. He will assist in the coordination of sales and factory problems and make his headquarters at the company's home office in Pittsburgh. For the past two years he has been the general manager of the Pittsburgh-DuBois division of Rockwell.

L. A. Dixon Jr.

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The first drilling rigs—first refining equipment—were adequate for that early demand.

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Each year demand made them bigger and better!

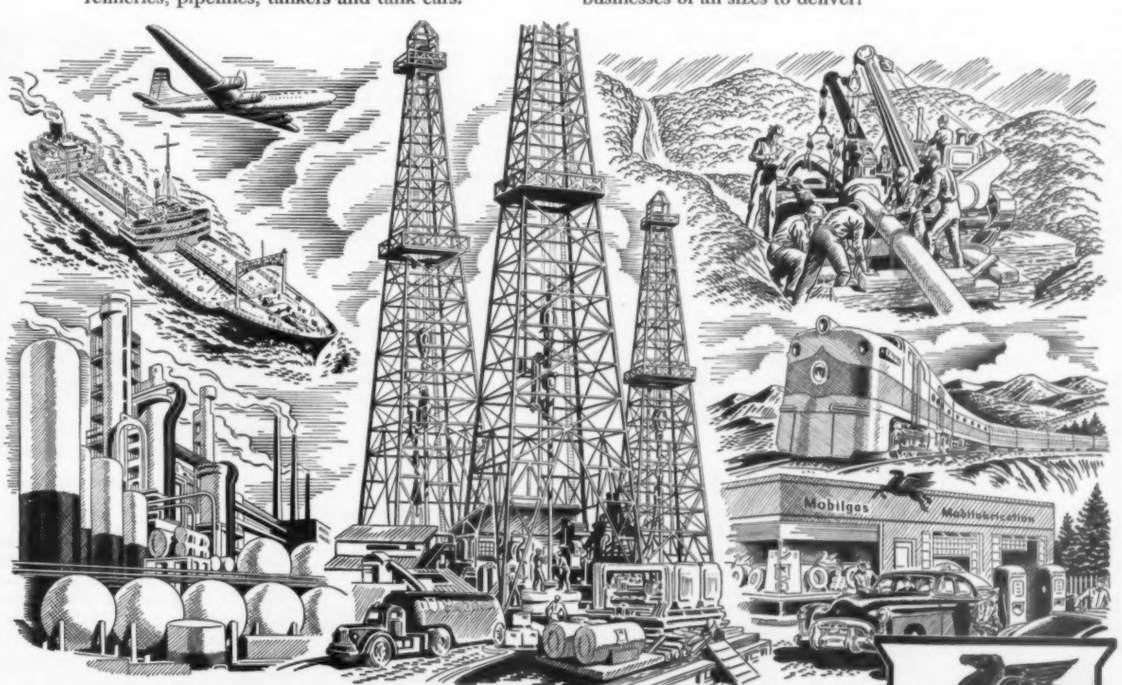
Today, thousands of oil companies with oil fields, refineries, bulk plants, service stations and cost-cutting transportation systems—deliver over 1,840,000,000 barrels of petroleum yearly—meet U.S.A.'s demands for *value in oil.*

And, today, the responsibilities of Socony-Vacuum, one of the oldest companies in the industry, are constantly mounting . . .

Unprecedented demand for petroleum products calls for expansion in every phase of our efficient, coordinated operation . . .

46,400 independent "small" businessmen must be kept *competitive*—supplied with what it takes to provide a *big money's worth* for you—a good living for themselves.

When 150,000,000 Americans say, *"I want,"* it takes businesses of all sizes to deliver!



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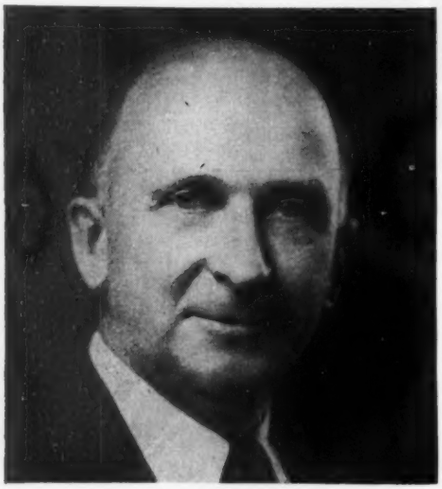
SOCONY-VACUUM

Heads Du Pont Houston Office

Alfred R. Mullis has been appointed manager of the Gulf Coast district office of the petroleum chemicals division of the Du Pont Co. with headquarters in Houston, Texas. He has been with Du Pont since 1947 as a petroleum chemicals division service representative in the Gulf Coast district. Following graduation from Rice in 1938, Mr. Mullis was employed in the research and development department of Humble Oil and Refining Co. at Baytown, Texas. He spent four years in the Navy as petroleum inspector in the Bureau of Ships.



C. E. Meyer

C. E. MEYER has retired as a vice president and director of Standard-Vacuum Oil Co. after 37 years in the international oil industry. A marketer of petroleum products in the Orient for nearly 30 years, Mr. Meyer first went to China in 1913, later serving in Japan where he became general manager for Standard-Vacuum. Held as a prisoner by the Japanese authorities after the outbreak of World War II, he was released and repatriated on the "Gripsholm" in 1942. For the remainder of the war Mr. Meyer filled the important post of petroleum attache at London in the United States Embassy there.

Mr. Meyer rejoined Standard-Vacuum in New York in 1945 as a director, becoming a vice president the following year. In this position he has supervised the company's activities in Japan and China, all of Stanvac's tanker operations and the company's employee and public relations programs.

Venezuelan Production

Venezuelan production reached new high levels in June as the companies continued to pump backed-up crude in an effort to make up for the losses incurred during the illegal strike of early May. In the week ending June 16, a new all-time record of 1,586,866 barrels per day was achieved.

Recent trends are shown by the second-quarter daily production averages in the following table:

Company	April	May	June (Est.)
Creole	642,821	550,614	676,000
Shell	450,220	364,565	470,000
Mene Grande	207,592	200,049	265,500
Texas-Mercedes	39,830	37,516	45,500
Socony	31,562	33,465	35,000
Atlantic	25,153	23,308	23,100
Richmond	8,391	10,008	19,000
Sinclair	13,583	13,198	13,500
Pantepec	13,009	10,715	13,100
Phillips	8,504	8,250	8,300
BCO, Ltd.	1,028	991	1,000
Totals	1,441,243	1,252,679	1,570,000

July exploration activities in Venezuela showed a 45-percent decrease from July a year ago, with 30 parties in the field compared with 54. The big cuts have been made in the more costly geophysical activities. Last year 20 seismograph and 10 gravimeter parties were operating, as against ten and three respectively this July. Surface geological parties were down from 20 to 14, and structure drills from four to one.

Two new marine parties were due to start operations in July and August. A crew of the Gravity Meter Exploration Co. was brought down from Houston by Texas Petroleum Co. to run a project in the Gulf of Venezuela. Marine Instrument Corp. of Dallas a little later signed a contract for a 1,650-mile seismic project in the same general area, working successively for Creole, Mene Grande, Shell and Richmond in the shooting of underwater concessions.

There were 71 rigs drilling new holes in Venezuela as July began, 50 on development wells and 21 on wildcats, long stepouts and new-pool tests.

Atlantic-Lion's new-field wildcat Guasare-1, aiming for production from the Cretaceous limestone in the old Eocene Amana field northeast of the prolific Mara field, was at final depth 14,460 feet and preparing to test. This is the deepest hole ever drilled anywhere by the Atlantic organization.

Another Cretaceous play, Shell's DMC-1, east of the Mara field, was suspended at 13,362 feet in early July after several weeks of testing. Shell's DMM-1, northeast of Mara, was drilling below 8,300 feet, and their DPE-1, northwest of Guasare-1 on Vimax acreage, continued making hole at about 5,500.

Richmond's Cretaceous test Zulia 34D-1, 40 miles southwest of Maracaibo, was abandoned at 13,400 feet and the rig was laid down. Their other Cretaceous test (and only other current hole), Zulia 1C-1, was plugged back to test shallow sands after failing to find limestone production at 13,602 feet at a location 10 miles south of Maracaibo.

Creole's Alturitas-1, at 17,039 feet in the fourth deepest hole in the world, continued successfully testing Eocene sands after mechanical trouble lost the bottom several thousand feet of hole. This wildcat is in hostile Indian country, far up the Rio Negro in the southwest Lake Maracaibo region.

In eastern Venezuela Mene Grande found two new reservoirs in Chimire with OZ-318 and one each in Nipa, Leona and the OG-286 area of the Oficina field, with WNZ-39, LM-202 and OG-289 respectively.

Socony plugged and abandoned Farallon-1 northwest of Mene Grande's Nipa field as dry, but completed Chimire-35R, over a mile from production, for 243 barrels.

Venezuela Atlantic began a Cretaceous test, Ruiz 3-33, to about 8,000 feet in the Ruiz field of Guarico. While this was still drilling, they began and completed dually Ruiz 3-101, a 3,100-foot twin to a dual-zoner, Ruis 3-39, which was completed at 4,567 feet total depth.

Mene Grande began CaXZ-101, about four miles northwest of the discovery well in the Caico Seco field, and Sinclair's Guere-1, four miles west of Mene Grande's recent discovery Los Mangos-1, was scheduled to spud about the 10th of July.

Sinclair Appoints Chief Chemist

Sinclair Refining Co. has announced the appointment of N. J. Gothard as chief chemist with headquarters at Harvey, Ill., where Sinclair's research laboratories are located. Mr. Gothard joined Sinclair at East Chicago in 1919 as a chemist, was subsequently appointed assistant chief chemist, and on June 1 of this year was made chief chemist.

Born in Dundee, Ill., he received his early education in grade and high schools there and graduated from the University of Wisconsin with a degree in chemistry in 1914. Prior to joining the Sinclair company, he worked with Armour & Co. in Chicago and also with the Sanitary District of the City of Chicago.

Mr. Gothard is a member of the American Chemical Society, the American Oil Chemists Society, the Society of Automotive Engineers and the American Society of Lubrication Engineers. He has been active in the American Society of Testing Materials, the American Petroleum Institute and National Lubricating Grease Institute committee work, and served as president of the National Association of Insecticide and Disinfectant Manufacturers Inc.

Empire Oil

John P. Herrick, writer, editor and for many years a prominent figure in the oil industry of eastern United States, has combined the results of long and careful research with personal recollections and anecdotes collected from veteran members of the industry in a substantial and entertaining volume under the title, "Empire Oil." The work is primarily a history of oil discovery and production in the state of New York, but it casts many interesting sidelights on other developments of the pioneer days of the industry.

Although New York never has figured as a leading factor in American oil production, Mr. Herrick points out to his readers that the first discovery of oil within its borders in modern times (omitting the celebrated visit of the French missionary, Father de la Roche d'Allion's visit to an oil spring near Cuba, New York, recorded in 1627) was made in 1832, which was 27 years before the drilling of the Drake well in the neighboring state of Pennsylvania. The first commercial well in New York was completed in November 1865, and since that time the state has produced over 170 million barrels of oil and is still producing at the rate of four million barrels yearly.

More important commercially than the state's oil industry has been its production of natural gas. The first company to obtain a franchise for the distribution and sale of gas was organized in 1880, and during ensuing years many gas companies were established, some of which grew to much more than local stature. The narrative which Mr. Herrick has woven around the 85-year life of the Empire State's oil industry is an entertaining story as well as a noteworthy contribution to the literature of petroleum.

Empire Oil, by John P. Herrick; 478 pages with illustrations. Published by Dodd, Mead & Co., $5.00.

Harold D. Osborn

HAROLD D. OSBORN, assistant controller, General Petroleum Corp., has been elected president of the Petroleum Accountants Society of Los Angeles. Other officers elected are: first vice president, F. S. R. Sedding, Doheny-Battson Interests; second vice president, J. R. Brown, Standard Oil Co. of Calif.; secretary treasurer, C. F. Wilmsmeier, Western Gulf Oil Co. A new director, V. T. Gilchrist, The Superior Oil Co., was elected to fill a vacancy.

World's Largest Vacuum Flasher

Standard Oil Co. of Calif. will erect a vacuum flashing unit at its Richmond refinery which is thought to be the largest yet employed by the industry. The unit will charge 55,000 barrels of reduced and heavy crude to produce 30,000 barrels daily of catalytic cracking charge stock. Bottoms will be charged to visbreakers for further processing. The M. W. Kellogg Co. will build the unit, which will include a main vessel with a maximum diameter of 27 feet and a height of 80 feet.

H. Gardiner Symonds W. C. MacMillan

Continental Elects Directors

Election of W. C. MacMillan and H. Gardiner Symonds to the board of directors of Continental Oil Co. has been announced by President L. F. McCollum. Mr. MacMillan is executive vice president of Continental; Mr. Symonds is president and a director of the Tennessee Gas Transmission Co. He is a director of several other large corporations and also of the National Bank of Commerce, Houston.

Associated with Continental for more than 22 years, Mr. MacMillan rose through the ranks to his present executive position. He joined the company as an instrument man in the geological department at Shawnee, Okla., and became successively assistant land superintendent, manager of the land department, vice president in charge of production and then vice president and administrative assistant to the president. He was elected executive vice president in September 1949. Mr. MacMillan was born at Williamstown, Mass., and attended Brown University.

Drill String Stabilizing Tool

Security Engineering Co. Inc., Whittier, Calif., now is manufacturing a reamer-stabilizer designed to be run between drill collars to eliminate drill string whip and vibration while reaming to gage. Three angularly set barrel-shaped cutters act as a large roller bearing contacting over one-third of the hole circumference, absorbing and transmitting to the formation all forces tending to start drill stem whip and rock bit gyration. Heavy ribbed sections between the cutters not only provide the extra strength required for stabilizing duty but act as a guide for the return circulation, directing it past the cutters to keep them free from cuttings.

To Expand Steel Output

The Youngstown Sheet and Tube Co. plans to build four new open-hearth furnaces and other facilities at its Indiana Harbor plant at East Chicago, Ind., to produce 550,000 to 600,000 tons of ingots per year. Total company capacity will rise to 4.5 million tons.

New Isotrope Laboratory

U. S. Bureau of Mines is installing a radioisotope laboratory at Bartlesville, Okla., for the study of secondary recovery methods. Introduction of tracers in input wells and recovery in production wells in water flood projects is expected to reveal the exact extent and advance of water.

Appoints Financial Consultant

In furtherance of plans to aid independent jobbers in accounting and related fields, Deep Rock Oil Corp. has announced the appointment of Carl E. Quinn as financial consultant. This new position was created as a result of policies formulated in 1949 for the conversion from company-operated marketing activities to independent jobbing operations.

Many Deep Rock jobbers previously were commission or salary agents, operating properties for which the company kept and supervised accounts. Now as independents, the jobbers are responsible for their own records, including financial and operating statements in addition to complex tax returns.

A native of Illinois, Mr. Quinn has a degree in commerce from Notre Dame. His experience in oil started in 1940 and includes all phases of field accounting and plant operations. Mr. Quinn is scheduled to visit all Deep Rock jobbers in his work of helping them simplify their systems and accounting work in line with modern business practices.

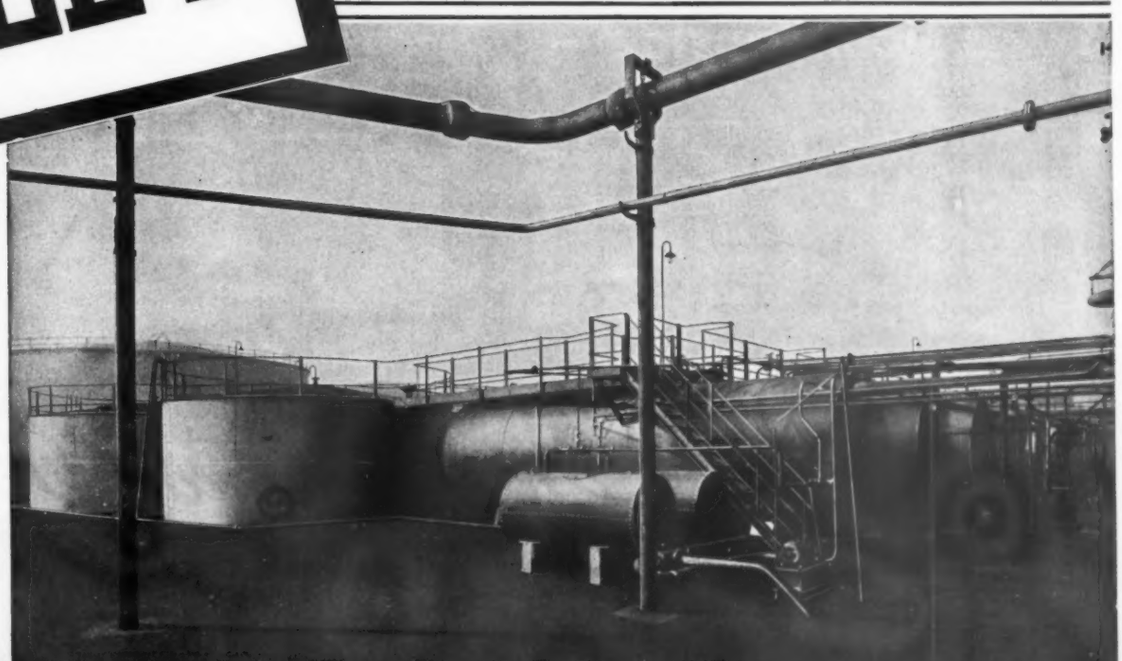
Gulf Executives Visit Venezuela

E. S. Bleecker, manager of western hemisphere operations for the foreign production division of Gulf Oil Corp., inspected the Venezuelan operations of Mene Grande Oil Co. during the last two weeks of June. A. B. Sloss, assistant to the president of Gulf, and E. W. Brake of Gulf's production department were also in Venezuela. The party was accompanied on a tour of inspection of Mene Grande's eastern and western fields by Robert L. Boggs, vice president of Mene Grande, and George L. Lockett, chief geologist.

W. J. Wilkins, chief of Gulf's transportation branch of the production and pipeline departments, was also a visitor to Mene Grande's operations in Venezuela during July.

OXLEY

WELDED STORAGE TANKS



Part of a battery of ten, electrically-welded steel storage tanks 9'x0" dia. x 30'0" long with tank in background 25'0" dia. x 10'0" deep. Erected at Ellesmere Port, Cheshire. (Photograph by courtesy of Lobitos Oilfields Ltd.)

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Tax Bill Hearing

(Continued from page 35)

abandonments in the course of oil field exploration and development.

It was pointed out in oral and written statements by members of the industry that the effect of this section of the law would so increase the financial risk of exploration that activities in the search for oil would be greatly decreased and many individuals would be driven out of business.

Russell B. Brown, general counsel to the Independent Petroleum Association of America, presented figures to the committee showing that more than 200 million acres of nonproductive land were estimated to be under lease for oil and gas in 32 states at the beginning of 1950 or more than ten times the 16 million acres of proven production. It is estimated that between 40 and 50 million acres, or about 20 percent of the total under lease in the United States, are abandoned each year at a loss to the oil operators. The extent of the losses is further indicated by the fact that the oil industry has drilled 640,000 holes in the past 25 years. Of these 170,000 failed to produce oil or gas and had to be abandoned at a complete loss. Of exploratory wells little more than one out of ten is productive, and losses on these are correspondingly higher. But it is only by constant replacement of the abandoned property that the industry can be kept in existence and its rise maintained. To deprive operators of the right to charge these unavoidable losses against current income would mean that productive capacity would be reduced, the tax revenues would decline and national security would be endangered.

New Catalyst Production Method

Davison Chemical Corp. is converting part of the capacity of its Cincinnati, Ohio, synthetic fluid catalyst plant from the ground type of production process to the spray drying method. A stainless steel spray drying chamber 22 feet in diameter is being installed to produce a microspheroidal form of catalyst having uniform particle size distribution. Within the chamber the material is processed in counter flow with flue gas.

A new washing system is also being installed which is said to give the catalyst similar, but improved chemical characteristics. Basic design requirements for the new equipment were worked out in the Davison laboratories. Design details were developed by operating full scale pilot plant equipment on a semi-commercial basis. Installation is expected to be completed and production under way by October 1950.

To Increase Line Capacity

Plantation Pipe Line Co. plans to increase the capacity of its products pipeline from Baton Rouge, La., to Greensboro, N. C. Charles R. Younts, president of Plantation, said a parallel pipeline is being considered for the greater part of the present main line route. Plantation's present capacity is approximately 95,000 barrels daily. Work on the new line is expected to get under way after January 1, 1951, with completion in early 1952.

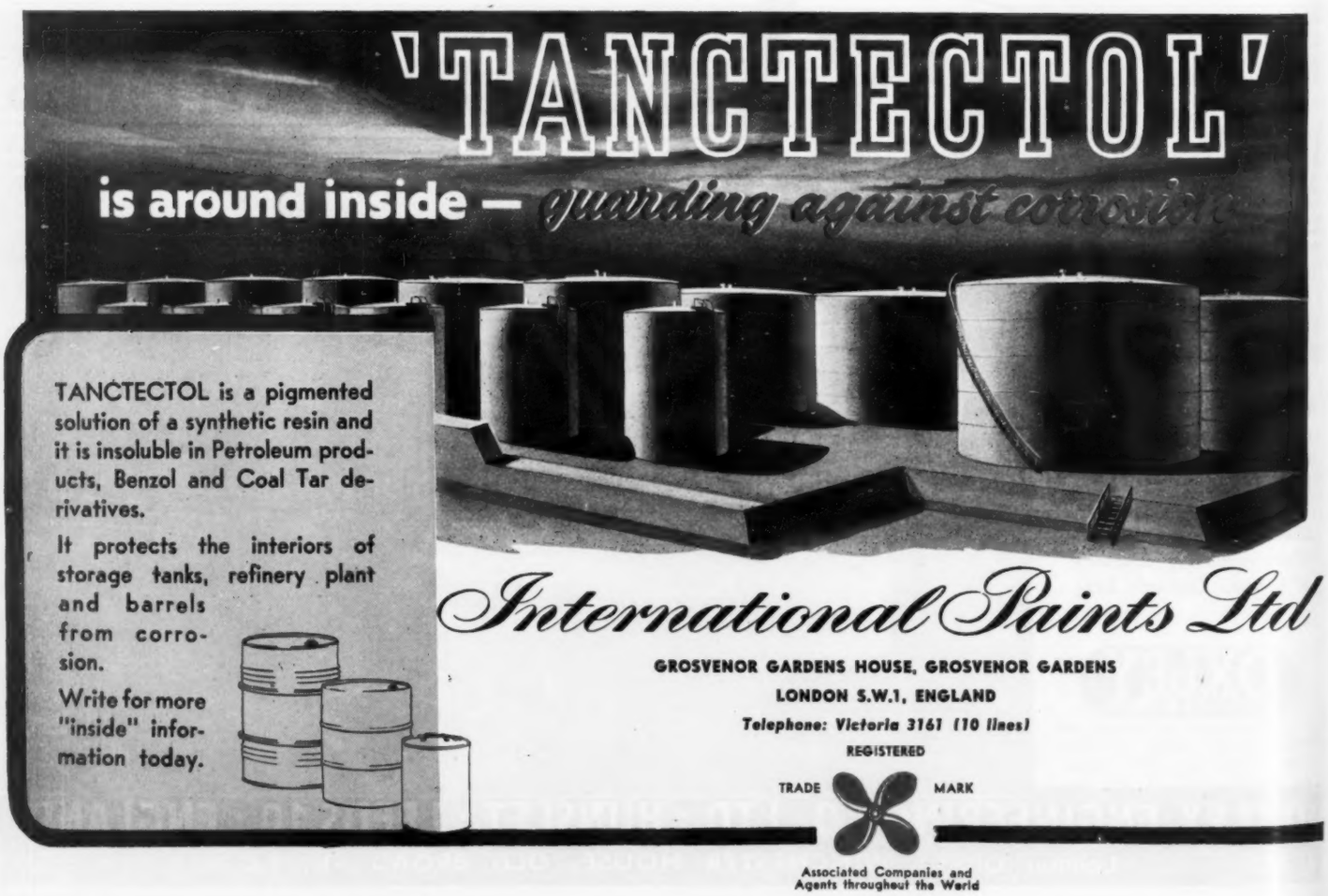
Dean Walling V. E. Prestine

Western Geophysical Appointments

Dean Walling has been elected executive vice president of Western Geophysical Co. of America, according to an announcement by Henry Salvatori, president and sole owner of the recently reorganized company. He occupied the same position with the former company at the time of reorganization. V. E. Prestine was named as vice president and assistant manager of operations. Mr. Prestine began with Western Geophysical as a field crew computer in 1935. He was Rocky Mountain supervisor prior to his new appointment.

New Crude Line Planned

The Ohio Oil Co. is planning construction of a new 20 and 22-inch crude line between Wood River and Lima, Ohio, to replace existing lines, many of which have been in operation for over 40 years. Construction is to be started the latter part of this summer.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"Our Oil Resources"

A survey of the American oil industry, its recent progress and present outlook, has made its appearance under the title, "Our Oil Resources." The book was originally published under the same title in 1945. To all intents and purposes, however, the current edition is a new work, being a complete revision with much late and new material added. It includes chapters by sixteen leading authorities dealing with different phases of the oil industry, such as technological progress, production, reserves, foreign operations, finance and other subjects of essential importance. An interesting chapter is contributed by the editor, Leonard M. Fanning, author of "The Rise of American Oil" and "American Oil Operations Abroad," gives a case history of oil shortage scares which have shown a habit of recurring frequently throughout the course of the industry. As Mr. Fanning observes in the concluding sentence of his account, referring to the scotching of these scares through fresh discoveries by oil men themselves, "They always find the oil."

"Our Oil Resources" is a compilation of up-to-date information valuable alike to members of the oil industry and to others who desire to keep informed of its progress.

"Our Oil Resources" by Leonard M. Fanning, 420 pages; published by McGraw Hill Book Co., 1950. Price $5.00.

To Build New Catalyst Plant

American Cyanamid Co. will soon build a $3 million plant in East Chicago, Ill., to produce cracking catalysts. The East Chicago plant will increase company capacity by more than 50 percent, which will mean production of more than 3,000 tons of catalysts per month. It is expected that the new facilities will be in operation towards the middle of 1951. Cyanamid already has a plant in Fort Worth, Texas. The company is the only producer of microspheroidal cracking catalysts. At the new plant production will be devoted primarily to these microspheroidal type catalysts.

Premier to Install Platforming Process

Premier Petroleum Co. has announced plans to install a Platforming unit at its Fort Worth refinery. Premier's unit will be the first installed in the State of Texas. Bell Oil and Gas Co. is building a unit at Grandfield, Okla., which is the first in the southwest.

The Premier Platforming unit will be designed to handle approximately 1,500 barrels of charging stock per day, and design and construction of the facilities will be under the supervision of Universal Oil Products Co., discoverers and developers of the Platforming process.

Sinclair Buys Wood River Refinery

Sinclair Refining Co. has acquired the refinery of the Wood River Oil and Refining Co. at Hartford, Ill., and its 67-mile products pipeline from Peru to Rockford, Ill. The 30,000-barrel Wood River refinery is located on a 431-acre site with Mississippi River frontage at Hartford, about 15 miles north of St. Louis. No part of the plant is more than 10 years old. It is built to process sour crude and equipment includes a catalytic cracker. Sinclair now operates seven refineries.

Tuscarora to Treble Capacity

Reconstruction of Tuscarora Oil Company, Ltd.'s 360-mile products pipeline system between Linden, N. J., and the Pittsburgh, Pa., area, has been announced by John de Groot, president. The program includes the complete replacement of pipe of varying size with 10 and 12-inch diameter pipe and the installation of four large pumping stations to replace nine now in operation. Present capacity of 25,000 barrels a day of gasoline and distillate fuels will be raised to 45,000 barrels initially with a potential capacity of 80,000 barrels. The system was first laid in 1908 as a crude line. It was converted to products in 1930 but returned to crude service for military requirements during World War II.

W. H. Siems

W. H. Siems Assumes New Post

W. H. Siems, former export manager of the New York office of Hughes Tool Co., has been appointed assistant general sales manager, according to an announcement by M. E. Montrose, vice president and general sales manager. Mr. Siems, a native Texan, joined the company in 1920 and has made his headquarters in New York for the past 20 years. While serving as export manager, he traveled in more than 30 foreign countries. In Houston he will assist in the general supervision and coordination of the company's field sales and service activities, both domestic and foreign. While Mr. Siems retains the major responsibilities in the foreign sales organization, O. B. Lathrobe takes on added duties as foreign sales manager in New York.

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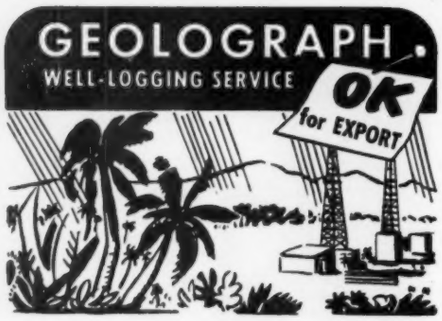

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George M. Parker

Heads European Esso Export Office

George M. Parker has been elected vice president of Esso Export Corp. and will be in charge of the European office. He will maintain close contact with all foreign affiliates of Jersey Standard and assist in the working out of any special supply problems that may arise due to present-day world economic conditions.

Mr. Parker has served the Jersey company as advisor in marketing operations in Latin America, the United Kingdom, Europe, North Africa and the Near East. During the war he served the War Production Board in an advisory capacity. He served in the U. S. Navy in World War I and later as an officer of the United States Air Corps.

Caltex-British Agreement

W. H. Pinckard, chairman of the board of the Caltex Companies, announced on July 18 that the company had concluded negotiations in London with the British government under which Caltex oil refined at Bahrein from both Aramco and Bahrein crude for distribution only in the sterling area by Caltex (U.K.) Ltd., a British company in the Caltex group, now qualifies as sterling oil.

Agreement has been reached with the British government on a mutually satisfactory reduction of dollar cost elements of Caltex oil sold by Caltex (U.K.) Ltd. This agreement was facilitated partly by an arrangement under which Aramco can now accept substantial payments from Caltex (U.K.) Ltd. in sterling and can use such sterling in current operations, and partly by Caltex using the sterling oil which it produces at Bahrein, in mixture with the Aramco crude refined for Caltex (U.K.) Ltd. at Bahrein, and by the conversion of tanker freight to a sterling basis. Caltex is now building seven tankers in the United Kingdom and will order two more soon. All of them will be employed in carrying Caltex oil from Bahrein to the sterling area.

It was stated that this is an individual agreement between Caltex as a company and the British government and that its provisions do not affect the discussions which are understood to be still taking place between the United States and British governments on other aspects of the sterling-dollar oil problem.

Mr. Pinkard states that the British Ministries concerned in the negotiations have been most cooperative and helpful in working out this solution.

New Furnace Black Plant

J. M. Huber Corp. will build a new furnace carbon black plant near Baytown, Texas. It is expected that the plant will be completed by March 1, 1951 and will cost $1.5 million. Its annual capacity will be 30 million pounds of black. Raw material will be oil. The company now produces both channel and furnace blacks at Borger, Texas. It also is an independent producer of oil.

Germany's Reserves Grow

During the past year the search for oil in northwest Germany has brought discoveries which have led to a new valuation of Germany's underground reserves of crude and have given the Federal Republic an enhanced position among oil countries. According to a computation issued by the Amt fuer Bodenforschung (geological research office), 36.5 million tons have been proved as certain or probable crude reserves in the oil provinces Hanover, Emsland, Schleswig-Holstein, Hamburg and Baden. Considering that only last summer the same authority gave a figure of 20.2 million tons, it can easily be seen what a big step forward Germany has taken in the meantime. In view of the discovery of types of deposits hitherto unknown in Germany (deep anticline intermediate structures in the Hanoverian salt dome area and a stratigraphic trap in the Emsland), it can be assumed that more finds will be made at places which have not yet been tested.

In the computation of reserves, Emsland leads with 26.7 million tons or 73 percent of the total German figure. Reserves in the Hanoverian district have increased by 84 percent since last summer and now amount to 8.2 million tons. In Schleswig-Holstein the further exploration on the western flank of the salt structure Heide-Meldorf brought the reserve of this province together with the Hamburg area to 1.6 million tons. At the bottom of the list is Baden with a reserve figure of 40,000 tons.

Quakenbrueck 5 drilled by Oldeburgisch Erdoel-GmbH. (joint interest company of Gewerkschaft Brigitta and Deutsche Vacuum Oel AG.), has now come into production with an output potentiality of 20 tons per day through a 5-mm choke. Production tests with different chokes are being continued. The crude has a considerable paraffin content with high cold test.

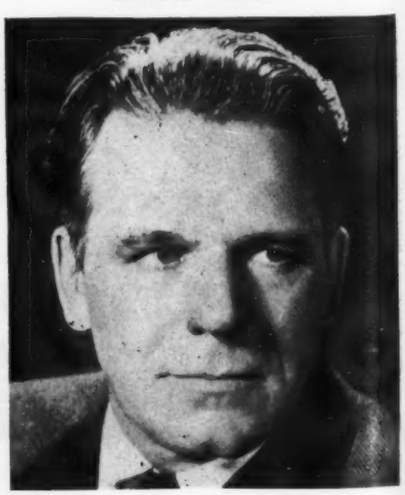
Diesel Engine Specifications

A specification pamphlet describing the new International model UD-6A diesel engine and power unit has been published by the merchandising services department, International Harvester Export Co., 180 N. Michigan Ave., Chicago 1, as form E-107-NN. The booklet points out new features of the new model, gives performance charts and equipment combinations.

Heads Ethyl Sales In West

Meredith Littlefield, sales coordinator in charge of the San Francisco office, has been appointed manager of the western sales region of Ethyl Corp. He succeeds Sanford M. Wagner, who earlier in the year was elected vice president in charge of sales. Mr. Littlefield has been with Ethyl 21 years on sales assignments in New York, Mexico and South America before being transferred to the San Francisco office in 1940.

Meredith Littlefield



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Oil Industry Equipped

(Continued from page 28)

oil company; and a 13,000-ton butyl rubber facility at Baton Rouge, La., to be operated by Esso Standard Oil Co. GR-S rubber is suitable for auto and light truck tires but not for heavy equipment such as airplanes. Butyl rubber is ideal for inner tubes for tires.

Reactivation of the plants bring to 18 the number of government-owned synthetic rubber plants in operation. Nine others are still in standby. Those operating have a combined capacity of 500,000 tons of general purpose and 75,000 tons of special purpose butyl annually. While the move to reopen additional plants was started before the Korean fighting began, that development spurred the action. High prices for natural rubber from the Far East, along with the possibility that this supply might be unavailable in the event of war, are given as reasons for the action.

Overall, the United States this year probably will use about 670,000 tons of natural rubber and 480,000 tons of synthetic rubber, assuming no full-scale war develops. In the event of a war the United States would need a minimum of 900,000 tons of rubber, under strict rationing to civilians, and to produce this the synthetic industry is relied upon. At this writing, the attempts to write a law whereby the government would sell its rubber plants to industry are at an end, for the time being, with the government still in possession.

For the Pacific operation, first needs appear to be a larger supply of high octane gasoline and jet fuel, motor fuel for tanks and other mobile weapons, heavy oil for the ships that are being called into service, butadiene for rubber and possibly toluene and isopentane.

New Synthetic Rubber

A new synthetic rubber, made without critically short styrene, has been developed by Phillips Petroleum Co. in cooperation with the Office of Rubber Reserve. Limited road tests indicate that the new rubber, called polybutadiene or PB rubber, is superior to GR-S synthetic rubber and perhaps to natural rubber for tire treads. It may even be equal to "cold rubber" in quality.

Previous efforts to make polybutadiene synthetic rubber commercially were unsuccessful because the rubber obtained was difficult to process and had poor physical properties. A quality suitable for use in tires was finally obtained in Phillips laboratories by making it much softer than usual and at moderately low temperatures. In the new process high abrasion furnace carbon black is mixed with the polybutadiene latex before conversion to solid rubber. Production of the new rubber for use in manufacture of thousands of tires for further proving on highways has been scheduled by the Office of Rubber Reserve.

Gehres Wins Honorary Degree

Hewitt A. Gehres, executive vice president and director of engineering of Cooper-Bessemer Corp., was recently granted the honorary degree of Doctor of Science by Grove City College, Grove City, Pa. In presenting the degree, Dr. Weir C. Ketler, the college president, congratulated Mr. Gehres on his many important accomplishments and on the high position he has attained in the engine-building industry during his 40 years of service with Cooper-Bessemer.

M. E. Montrose

Hughes Tool Appointments

M. E. (Monty) Montrose, vice president, sales; Daniel J. Martin, vice president, engineering; and Thomas A. Slack, vice president, general counsel, have been elected directors of Hughes Tool Company. The addition of these top executives to the board brings closer coordination of the many commercial and engineering projects this company is undertaking in specialized oil well drilling equipment used throughout the world.

Book On Secondary Recovery

The Division of Production of the American Petroleum Institute has published a second edition of the book "Secondary Recovery of Oil in the United States" ($8.50). This volume consists of 55 chapters on all phases of secondary recovery operations. It brings between two covers the results of over 12 years of intensive study and investigation in which more than 300 petroleum engineers and geologists have participated. As might be judged even from its size (it weighs 5 lb. 4 oz. and contains 838 large, double column pages) it is comprehensive in scope and to this reviewer it is an obviously useful reference book as well as a guide to application of methods that will assure the maximum economic extraction of crude oil from underground reservoirs.

Besides general considerations the 55 chapters are grouped in three parts: Criteria for determining oil fields' susceptibility to secondary recovery methods, the development and operation of secondary recovery projects and descriptions of secondary recovery operations in 15 states. The reviewer's guess is that the last named part alone is worth the price. A bibliography of more than 100 pages lists every important paper on secondary recovery in the U. S. during the past 14 years. The editors have thoughtfully provided a topical index of this bibliography from which a reader can find reference to all major operations practiced in secondary recovery in all states and countries where secondary operations have been established.

The discovery of new oil fields is growing more difficult, and the industry is becoming more and more interested in this subject. This large book will surely be a great help in the effort to maintain the supply of oil.—O.W.W.

Erratum

In the July Canadian review number of World Petroleum it was stated that there are 3,130 shareholders in British American Oil Co. This is the correct number of preferred shareholders but, in addition, there are 20,900 common stockholders.

C. C. BENEDICT, eastern regional operating manager of Socony-Vacuum Oil Co. Inc., retired July 1. M. M. Beckes, operating manager of the company's Lubrite division, St. Louis, Mo., succeeded him.

Hughes Plans $2 Million Laboratory

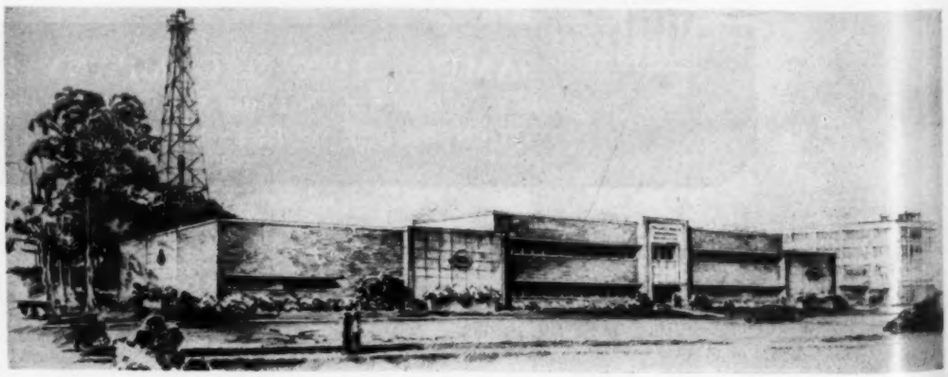
Plans have been completed for the erection of a $2 million engineering laboratory in Houston, according to an announcement made by Fred W. Ayers, senior vice president and general manager of Hughes Tool Co. The building will consist of a two-story center structure with wings for special test works in addition to a basement. Included in the center wing will be the metallographic laboratory, the chemical laboratory, emission spectrum laboratory, projection room, library and offices.

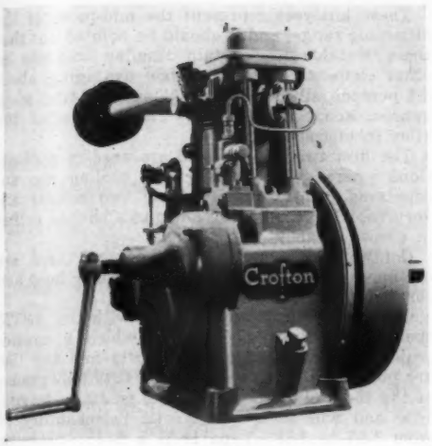
The east wing of the building will be occupied by the welding laboratory. In the north bays will be the laboratory machine shop, while the west bays will be occupied by the mechanical testing section. In the latter all kinds of unconventional tests with drill stem connections and rock bits are conducted. The new field size drilling rig will be removed from its present location to the new laboratory and will be set up at the northeast corner of the building.

The Hughes Tool Co. engineering laboratories are a division of the metallurgical department, which is one of the three engineering departments under Daniel J. Martin, vice president, engineering, and includes the research engineering, product engineering and metallurgical engineering departments. In the proposed laboratory building new designs and improvements on present products will be developed and standardized. Continuous research, in addition to that being done at the Armour Research Foundation and the Battelle Memorial Institute, will be carried out here in search of better materials and advanced designs in order to make superior products for the oil industry.

The new laboratory building is scheduled to be completed by June 1951. In addition to the present equipment, which will be moved to the new building upon its completion, a half million dollars will be expended for new laboratory machines, technical apparatus and equipment. The entire building will be air conditioned, including the working floor of the field size drilling rig.

Architect's drawing of the proposed $2 million Hughes Tool Co. engineering laboratories to be built in Houston.





Crofton Engine

Air-Cooled Diesel Engine

Crofton Diesel Engine Co., San Diego, Calif., has announced a new, improved low horsepower Crofton air-cooled diesel engine. The company states that, as a manufacturer of industrial diesel engines, it feels that the time has arrived when the user's cost for a small industrial diesel engine must approach presentday gasoline engine prices. The new model is intended to fulfill a general need where simplicity and efficiency are valued and where it is desirable to eliminate fire risks.

The new Crofton air-cooled engine has an output at varying speeds up to 3-bhp at 1,000 rpm, 4-bhp at 1,500 rpm, and 5-bhp at 1,750 to 2,150 rpm. Fuel consumption at the rated speed and power (1,500 rpm and 4-hp) is approximately 0.42 pint per bhp-hour. Standard grades of high-speed diesel fuel or any oil derived from crude petroleum of .88 specific gravity at 60°F may be used. Air cooling is provided by an efficient bladed flywheel housed within an airstream duct. The use of air cooling, moreover, does not increase the dimensions much over those of equivalent water-cooled diesel engines. The weight is extremely low at approximately 235 pounds.

Interstate Compact Governors Meet

Governors of member states of the Interstate Oil Company Commission and governors of other oil and gas-producing states held a meeting at White Sulphur Springs, W. Va., June 20, during the National Governors' Conference, over which Governor Roy J. Turner of Oklahoma presided as chairman. Principal topic of discussion at the conference was the extension of the Compact which will expire Sept. 1, 1951, unless renewed by Congress. Each governor present expressed himself as enthusiastically in favor of the Compact Commission's program and expressed a desire to see the Compact extended for an additional period of four years.

A resolution was unanimously adopted that the Interstate Oil Compact Commission should not only invite all non-member oil and gas producing states to join the Compact but should be active in securing their membership.

Pipe for Canadian Line

An order for 5,940 tons of steel pipe to be used in connecting the Interprovincial Pipe Line with the city of Winnipeg, Manitoba, has been placed with Stewarts & Lloyds Ltd., prominent British manufacturers. The order includes 80 miles of 10¾-inch-diameter line pipe and over 10 miles of connecting and distributing line and 300,000 feet of seven-inch casing. The line is being constructed by the Winnipeg Pipe Line Co.

CARL B. RICHARDSON, research geologist for Barnsdall Oil Co. for the past 13 years, has resigned to enter private consulting work. He is opening offices in Tulsa. Mr. Richardson is an authority on reef formation. He has worked in Latin America as well as in the southwestern fields of the United States.

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PROCESS HEATING

(Continued from page 48)

But various circumstances conspire to prevent all of this available heat from being absorbed by the transfer surfaces, namely, the pipes. To begin with, it is impossible to hold the flue gases inside the furnace until a condition of equilibrium in temperature has been reached between the gases and the absorptive surfaces. For that reason a very appreciable portion of the available heat is lost in moving the gas out of the furnace before it has exhausted its radiant energy.

As an example, consider a condition in which the furnace bridge-wall temperature is 1,500°F and the temperature of the tube surface is 1,000° F. The available radiant heat of the flue gas exiting from the furnace would be 27,300 Btu per pound mol of fuel burned, or 14.5 percent of the total available radiant energy. The operator of a furnace is compelled to live with this condition because of the necessity for continuous and rapid purging of flue gas to make room for still more flue gas produced by the burners. Another factor governing the rate of radiant absorption is the distance between the radiant and the absorptive bodies, with radiation varying inversely as the square of the distance. Also any particular radiant point is not surrounded entirely by absorptive surfaces, since a portion of its surroundings will be the refractory walls which absorb and re-radiate the energy.

The flue gas loss plus other variables make it impossible for all the available heat to be absorbed by the transfer surfaces before it passes from the radiant portion of the furnace. This figure has been calculated as high as 40 percent. Wonder arises as to just how furnaces perform as they do.

Mr. Reed believes he has found the answer in the manner in which furnace gases circulate in the heater, and in the influence of furnace design on the manner in which the gases circulate. It may be presumed that the gases resulting at the point of combustion flow more or less directly, if gently, toward the point of exit from the furnace, and that there is a progressive loss of heat by absorption so that the gases arrive at the bridge-wall with the temperature indicated. In point of fact it is to be agreed that the temperature indication at the bridge-wall is correct, but the means for reducing the temperature does not, according to the evidence in hand, lie in the gentle but direct flow toward the point at which the temperature is taken. The flow is not all direct, as very large portions of the gases are detoured by furnace characteristics and caused to recirculate.

Whether the heat absorbed by the transfer surfaces through this phenomenon of recirculation is to be considered as "convected" or "radiant" is unimportant. Any design which tends to hinder recirculation will cause inadequacies in service, as has been shown in numerous specific cases. In floor-fired furnaces the velocity of the descending column of gases is great enough to be seen blowing the flames on burners adjacent to the wall toward the center of the furnace. Another benefit attributable to recirculation is that the descending column heats the wall behind the tubes to cause the wall to radiate a far greater quantity of heat to the tubes than if there were no recirculation. Two instances are cited.

A furnace had been in service many years, and the wall behind the tubes had failed so that clearance between tubes and wall had been increased from its original two inches to almost six inches. With increase in recirculation space, there was a good increase in capacity. Since the wall was about to collapse, it was restored to the original position. When the heater went back on stream, it was capable of handling only 60 percent of the duty it formerly had handled. In this case it was clearly demonstrated that lack of space between the tube and the wall caused a very drastic reduction in the rate with which the heater could absorb heat, but the question as to whether the reduction was caused by lack of recirculation or lack of re-radiation was not resolved.

In another case there was a very clear-cut demonstration of the part played by recirculation with no interference being made with re-radiation. In the case of a floor-fired heater the operators observed that descending circulating gases blew the flame away from the side-wall tubes. They thought that by interfering with the descending column, the flames would no longer be blown toward the center, and a greater quantity of heat would be available for the side-wall tubes. Split bricks were set between the tube and the wall so that the brick failed to touch the tube by about one-fourth inch. Since there were but ten side-wall tubes on each wall, each tube had the space between it and the wall blocked.

When the heater was put on stream, the furnace was capable of only about 80 percent of its former duty, despite the fact that the flame no longer blew toward the center of the furnace but instead stood straight up to show no influence from recirculation.

The suggestion was offered that the idea of causing the flame to stand straight up possessed merit but that the means for causing the flame to so stand was probably in error, because the recirculation was to all appearances completely stopped, despite the fact that there was no interference with re-radiation from the wall. The split bricks were removed, and a wall 12.5 inches high, running the length of the furnace and almost tangent with the burner openings, was substituted. When the heater was again put on stream, it now handled approximately 20 percent more oil that it had been able to process before experiment. The flames stood straight up to prove that the wall was serving its purpose.

The improvement in capacity here was also partially due to improved distribution of the heat at the arch of the furnace, because it was no longer concentrated at the central portion of the arch. Allowing the flame to stand up straight accounted for this. The importance of recirculation in the furnace is thus demonstrated.

Modern furnace design, which increasingly tends to relatively long and relatively narrow furnaces, whether the length be vertical or horizontal and whether the shape be rectangular or circular, unconsciously perhaps follows the theory of recirculation. The smaller the open space within the furnace (within limits, of course), the more efficiently heat may be withdrawn from the open part of the furnace, and less heat is lost in direct flow to the point of exit as discussed previously.

It is suggested that a clearance of one-half a tube diameter be left between tube and wall.

Process heating inevitably brings up the subject of materials of combustion for such processes. Francis Fahrenwald of the Fahrenwald Corporation, which manufactures a range of oxidation and corrosion-resistant alloys, explained the role of these metal products in the oil refinery.

Addition of chromium to steel in excess of about 16 percent renders the steel almost completely immune to oxidation; at about 1,200°F, steel, with chromium less than 14-16 percent, has small-load carrying properties, too small to be used as a structural member. With addition of nickel to iron-chromium alloys, almost any desired combination of load-carrying ability, oxidation resistance or hot gas-corrosion can be obtained, within limits. However, it is to be understood that "oxidation and corrosion resistance are relative terms. Small additions of certain elements to the environment can make a tremendous difference in these particulars. In any case it is of the utmost importance that the designer knows exactly what the operating conditions will be.

From the many hundreds, and perhaps thousands of variations in the possible combinations of nickel, chromium and iron, a series of analyses has emerged as being the most practical for use in various commercial applications. These are as follows:

Percent Nickel	Percent Chromium
65	20
38	18
20	25
12	25
2	28
8	18
2 Max.	14

These analyses represent the mid-point of the allowable range, and it should be pointed out that these metals also contain smaller amounts of other elements: notably carbon averaging about 0.4 percent, silicon, about 1.75 percent, and manganese, about 1.5 percent. The balance of the alloy is, of course, iron.

The first two alloys listed are used in applications where cyclic heating and cooling are encountered. Unfortunately these two metals are very rapidly attacked by hot gases having sulfur in excess of about one percent.

Continuing down the list, the next three are the most widely used alloys for resisting heat and corrosion in the oil industry.

Oil men are probably familiar with the ASTM specification B-190-45-T, under which a considerable percentage of tube supports and the like are purchased. This specification lists two grades of the 25-12 alloy. Type I is the partially ferritic type and will show a magnetic permeability of from 1.05 to 1.70. Type II is a fully austenitic type, which should show a lower magnetic permeability of between 1.000 and 1.05. Permeabilities of above 1.70 probably would indicate too high a proportion of ferrite for the best high temperature properties. In general Type II, or the fully austenitic type, has higher high-temperature creep-stress values, but has lower ductilities than the Type I.

In general we can summarize by saying that if you want an alloy that is as strong as possible at high temperature, but not necessarily with high ductility, then the Type II grade of 25-12 is what you should have. However, if you have an application where high ductility is an important consideration, then Type I is indicated, but the long-time operating temperatures should not be in the critical embrittling range. Type I is often required where severe thermal shock is a factor.

Now turning to the 28 percent chromium—two percent nickel steel, this has a predominately ferritic structure and therefore will be rather weak at high temperatures; but it does possess good corrosion resistance, oxidation resistance and ductility at high temperatures. At room temperature this metal is very brittle and subject to breakage under shock, and it has rather difficult casting characteristics.

Nevertheless, even considering the casting difficulties and the room temperature brittleness of the 28 percent chromium alloy, it is still an excellent alloy for parts that are not subjected to drastic handling or to drastic thermal shock. The many tons of burner castings produced in this analysis bear testimony to the fact that this is a very useful alloy and certainly has its place.

Next is the 18 percent chromium, eight percent nickel alloy, which is commonly called 18-8 stainless steel. Here again we have numerous applications for corrosion resistance: pumps, valves and the like, but this material actually is not, or should not be used too extensively for high temperature operations. This alloy can be employed up to as high as 1,750°, but should be used only for intermediate and particularly quite constant temperatures. As a matter of fact, the list of alloys presented above is arranged in order of decreasing stability. Of course, no alloy in the commercial heat-resisting class possesses a chemical equilibrium which is perfectly stable against all temperature changes.

It is impossible to present briefly a complete discussion of all the factors which enter into the proper design and selection of heat-resisting alloys; but one important factor to which more designers should pay attention is the fact that these alloys are produced in the form of castings, and as such they have certain limitations as to section thickness, complexity and the like. All industries would be better served if more attention were given to designing for the foundry, as well as for the ultimate use.

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For the transformation of Havana's outmoded street transportation system to modern buses, an order for 620 diesel powered buses has been placed with Leyland Motors Ltd. of England by William D. Pawley, president of Autobuses Modernos S.A. at a cost of $8,680,000.

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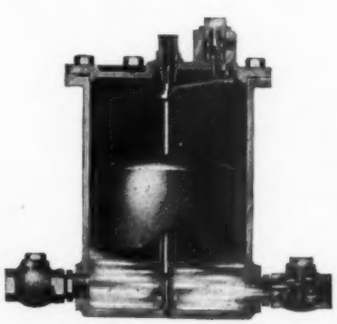

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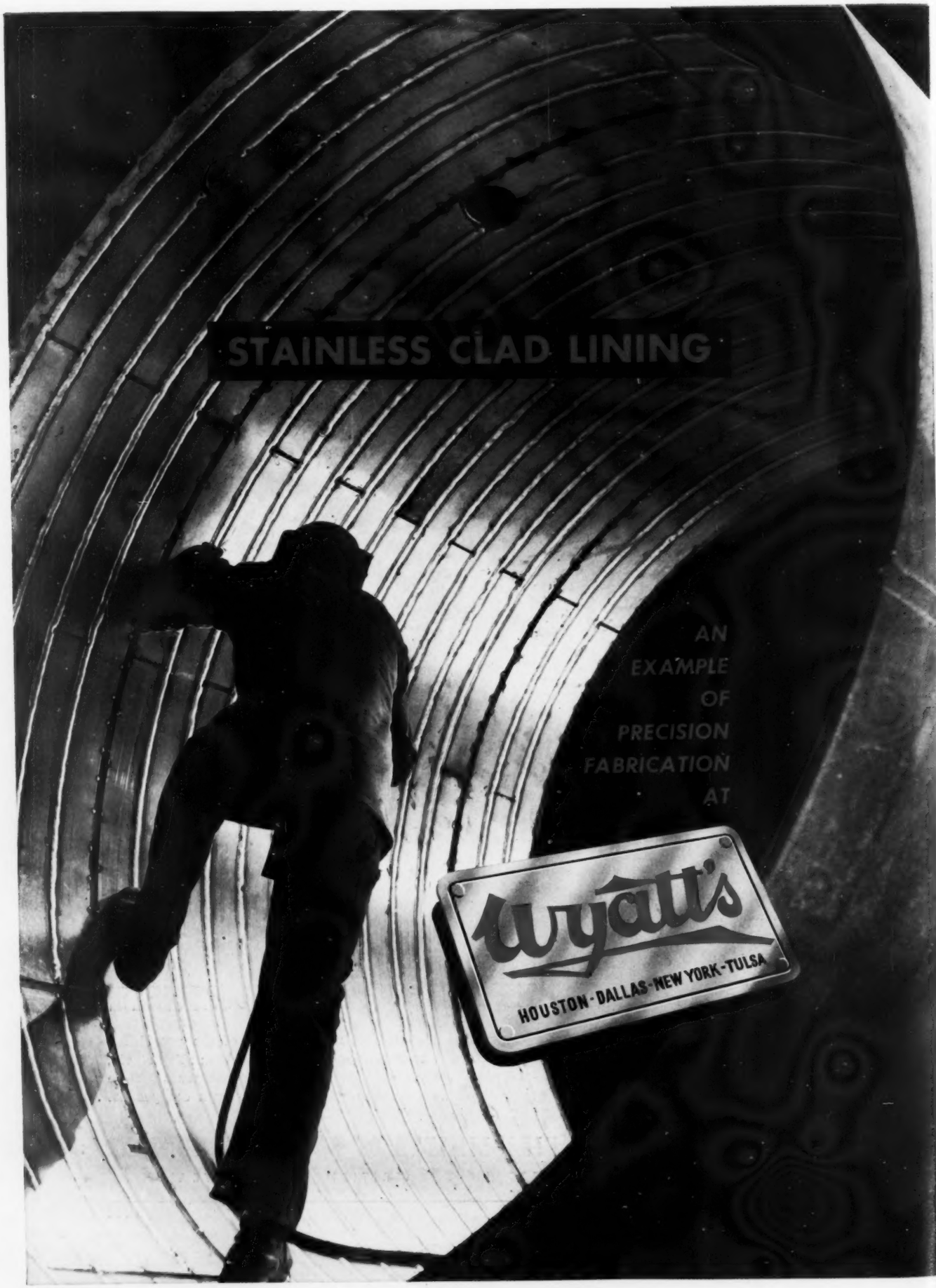
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